UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF CHEMICAL SAFETY AND POLLUTION PREVENTION

MEMORANDUM

Date: March 14, 2013

SUBJECT: Determination of Transferable Residues on Turf Treated with 2,4-D DMA + MCPP-p DMA + Dicamba DMA in Various Spray Volumes

PC Codes: 030001
Decision No.: 459422
Petition No.: NA
Risk Assessment Type: NA
TXR No.: NA
MRID No.: 44655703

DP Barcode: D410013
Registration No.: NA
Regulatory Action: NA
Case No.: NA
CAS No.: 2008-39-1 + 66423-09-4 + 2300-66-5
40 CFR: NA

FROM: Alexandra LaMay
Risk Assessment Branch VII
Health Effects Division (7509P)

THROUGH: Michael Metzger, Branch Chief
Risk Assessment Branch VII
Health Effects Division (7509P)

TO: Kathryn Montague
Registration Division (7505P)

This document serves as a data evaluation record for 2,4-D, MCPP, and dicamba turf transferable residue study, "Determination of Transferable Turf Residues on Turf Treated with 2,4-D DMA + MCPP-p DMA + Dicamba DMA in Various Spray Volumes". The study was conducted according to the provided protocol and OPPTS Series 875, Occupational and Residential Exposure Test Guidelines, Group B: Post-application Exposure Monitoring Test Guidelines, 875.2100, Transferable Residue Dissipation, Lawn and Turf. The primary study review was conducted by Versar, Inc, under the guidance of HED. A secondary review was conducted by HED and reflects current Agency policies. HED has determined this study is acceptable for risk assessment purposes.

The test substance, EH-1358 Herbicide, is a suspension concentrate/liquid (SC/L) formulation containing 11.98% 2,4-D DMA (0.88 lb ae/gallon), 4.55% MCPP-p DMA (0.33 lb ae/gallon), and 1.54% dicamba DMA (0.11 lb ae/gallon). Treated plots 2, 3, and 4 ,each received one broadcast foliar spray application of EH-1358 Herbicide to the turf with application rates of approximately 1.8, 0.66, and 0.22 lb ae/A of 2,4-D DMA, MCPP-p, and dicamba DMA, respectively. Transferable residues were collected using the modified California cloth roller technique. Triplicate TTR samples were collected from the treated plots before and after the application and up to 14 days following the application. TTRs were corrected using the analyte specific average field fortification recoveries. First-order dissipation kinetics was assumed to generate dissipation curves for 2,4-D, MCPP, and dicamba. The linear regression analysis was conducted using the natural logarithm of the individual foliar residue values collected immediately after the application through the sampling interval where all residue levels were less than the LOQ and no further residues were detected at subsequent intervals.

STUDY TYPE: Determination of Transferable Turf Residues on Turf Treated with 2,4-D DMA + MCPP-p DMA + Dicamba DMA in Various Spray Volumes: OPPTS 875.2100

PC CODE: 030001

TEST MATERIAL EH-1358 Herbicide is a multiple active ingredient (MAI) suspension concentrate/liquid (SC/L) formulation containing 11.98% 2,4-D DMA, 4.55% MCPP-p DMA, and 1.54% dicamba DMA.

SYNONYMS: 2,4-D DMA + MCPP-p DMA + Dicamba DMA; dimethylamine 2,4-dichlorophenoxyacetate + dimethylamine (R+)-2-(2-methyl-4-chlorophenoxy)propionate + dimethylamine 3,6-dichloro-o-anisate CAS Nos. 2008-39-1 + 66423-09-4 + 2300-66-5

CITATION:

Authors:	William Barney
Title:	Determination of Transferable Turf Residues on Turf Treated with 2,4-D DMA + MCPP-p DMA + Dicamba DMA in Various Spray Volumes
Report Date:	September 4, 1998
Analytical Laboratory:	Covance Laboratories Inc. 3301 Kinsman Boulevard Madison, Wisconsin 53704
Identifying Codes:	Sponsor Study Number BTH TFR TF 002; Grayson Research, LCC Project Number 98-314; Covance Study Number 6926-104; MRID 44655703; Unpublished

SPONSOR: Broadleaf Turf Herbicide TFR Task Force LLC
5 Victory Lane, Suite 201
Liberty, MO 64068
U.S.A.

EXECUTIVE SUMMARY:

This study was designed to determine the transferable turf residue (TTR) of 2,4-D, MCPP, and dicamba dislodged from turf treated with EH-1358 Herbicide at one location in the United States (Franklin County, NC) when applied using various spray volumes. The test substance, EH-1358 Herbicide, is a multiple active ingredient (MAI) suspension concentrate/liquid (SC/L) formulation containing 11.98% 2,4-D DMA (0.88 lb ae/gallon), 4.55% MCPP-p DMA (0.33 lb ae/gallon), and 1.54% dicamba DMA (0.11 lb ae/gallon). The test site consisted of four established turf plots. Plot #1 was identified as the control (untreated) plot. Treated plots 2, 3, and 4 ,each received one broadcast foliar spray application of EH-1358 Herbicide to the turf with application rates of approximately 1.8, 0.66, and 0.22 lb ae/A of 2,4-D DMA, MCPP-p, and dicamba DMA, respectively in April of 1998. The treated plots were treated with EH-1358 mixed to achieve a target spray volume of 2, 5, and 20 gallons per acre (GPA) for treatments 2,3 and 4 respectively. Each application was made using a tractor mounted sprayer. Transferable residues were collected using the modified California cloth roller technique. Triplicate TTR samples were collected from the treated plots before and after the application and up to 14 days following the application. The application method was relevant to the use pattern proposed. Additionally, climatic and other site conditions were relevant to the proposed use pattern.

The Registrant provided TTRs in ng/cm^2. The Registrant did not correct the data for field fortification recoveries. Versar corrected the TTRs using the analyte specific average field fortification recoveries. Correction was based on the fortification level closest to the determined residue from each site. TTR values reported as less than the LOQ were assigned a value of ½ LOQ.

The highest average TTR value generally occurred immediately after the application (0DAT) and dropped to below the LOQ by 2DAT (MCPP TRT 4 plots; dicamba all plots), 3DAT (2,4-D TRT 3 and 4 plots; MCPP TRT 2 and 3 plots), or 5DAT (2,4-D TRT 2 plot); the highest average TTR value for the 2,4-D and dicamba TRT 4 (20 GPA) plots occurred 8 hrs after treatment.

The highest average TTR residues occurred from TRT 3 (5 GPA) followed by TRT 2 (2 GPA). The highest average TTR residues all occurred at 0DAT for the 5 GPA treatments. The highest TTRs were 0.249 µg/cm^2 (1.24% of application rate), 0.090 µg/cm^2 (1.20% of application rate), and 0.036 µg/cm^2 (1.45% of application rate) for 2,4-D, MCPP, and dicamba, respectively.

The Registrant generated dissipation curves assuming a first order degradation of the natural log transformed data. The analysis was conducted using the average TTR values collected immediately after application through 1DAT (MCPP and dicamba TRT 3 and 4), 2DAT (2,4-D TRT 3 and 4; dicamba TRT 2), or 4DAT (2,4-D and MCPP TRT 2).

Versar assumed first-order dissipation kinetics to generate dissipation curves for 2,4-D, MCPP, and dicamba. Versar conducted the linear regression analysis using the natural logarithm of the individual foliar residue values collected immediately after the application through the sampling interval where all residue levels were less than the LOQ and no further residues were detected at subsequent intervals.

The following table provides the half-life values, as calculated by Versar and the Registrant.

Summary of Regression Analysis by Versar and Registrant for Turf Treated with EH-1358 Herbicide

Statistic	2,4-D			MCPP-p			Dicamba		
Treatment Number	2 2 GPA	3 5 GPA	4 20 GPA	2 2 GPA	3 5 GPA	4 20 GPA	2 2 GPA	3 5 GPA	4 20 GPA
Versar's Half-life (days)	0.54	0.29	0.32	0.37	0.27	0.28	0.38	0.32	0.33
Versar's R^2	0.707	0.903	0.963	0.796	0.933	0.966	0.623	0.935	0.943
Registrant's Half-life (days)	0.5	0.2	0.3	0.5	0.5	0.4	0.4	0.5	0.4
Registrant's R^2	0.716	0.914	0.945	0.770	0.941	0.928	0.648	0.951	0816

This study met the majority of the Series 875.2100 Guidelines. The following minor issues of concern are noted:

- The registrant did not correct residues using field fortification recovery data. Average low level field fortification recovery was 89.7%, 94.3%, and 79.4%, respectively, for 2,4-D DMA, MCPP-p DMA, and dicamba DMA. Average high level field fortification recovery was 78.8%, 88.5%, and 77.2%, respectively, for 2,4-D DMA, MCPP-p DMA, and dicamba DMA.

- The field fortification levels (0.004 and 0.04 $\mu g/cm^2$) did not bracket the field sample TTR values found on cloth dosimeters. Field study TTR values ranged from <LOQ (0.000897 $\mu g/cm^2$) to 0.270 $\mu g/cm^2$.

- The cotton matrix used in the field fortification samples was not "weathered" as is customary to simulate actual field sample collection. The cloths for the pre-application event fortifications were rolled over the grass prior to fortification, while the 6DAT fortification cloth was pristine when fortified.

- The production of metabolites, breakdown products, or the presence of contaminants of concern were not discussed in the Study Report.

- Turf transferable residue (TTR) data from this study are based on sampling from one test site only.

- Rainfall occurred on days 2 (0.17 inches), 3 (0.46 inches), 4 (0.03 inches), 5 (0.27 inches), 9 (0.37 inches), and 12 (0.12 inches) after treatment.

- A product label was not included with the study report; therefore, it is not certain if the maximum application rate, minimum retreatment interval, and accurate spray volume were used.

- Only temperature and precipitation data were provided for the duration of the study. Wind velocity was provided for the day of application.

COMPLIANCE:

Signed and dated GLP, Quality Assurance, and Data Confidentiality statements were provided. The study sponsor waived claims of confidentiality within the scope of FIFRA Section 10 (d)1(A), (B), or (C). The Study Report indicated that the study was conducted under EPA Good Laboratory Practice Standards (40 CFR Part 160), with the following exceptions: weather, field site history, and historical pesticide data, were not collected under GLP standards; some data were not recorded or corrected in complete compliance with 160.130 (e); and containers of the test substance were incorrectly labeled with expiration date and % ingredients at the experimental start date.

CONCURRENT EXPOSURE STUDY: No

GUIDELINE OR PROTOCOL FOLLOWED: This study was conducted according to the provided protocol and OPPTS Series 875, Occupational and Residential Exposure Test Guidelines, Group B: Post-application Exposure Monitoring Test Guidelines, 875.2100, Transferable Residue Dissipation, Lawn and Turf. A compliance checklist is provided in Appendix A.

I. MATERIALS AND METHODS

A. MATERIALS:

1. Test Material:

Formulation:	EH-1358 Herbicide is a multiple active ingredient (MAI) suspension concentrate/liquid (SC/L) formulation containing 11.98% 2,4-D DMA (0.88 lb ae/gallon), 4.55% MCPP-p DMA (0.33 lb ae/gallon), and 1.54% dicamba DMA (0.11 lb ae/gallon).
Batch/Lot #:	NB 20964.
Formulation guarantee:	A Certificate of Analysis was not provided. Expiration date: April 2001.
Purity:	The 2,4-D reference standard was analyzed and found to have a purity of 99.25%. Expiration date: February 2000. The MCPP reference standard was analyzed and found to have a purity of 100.00%. Expiration date: February 2000. The dicamba reference standard was analyzed and found to have a purity of 98.78%. Expiration date: February 2000.
CAS #:	2008-39-1 + 66423-09-4 + 2300-66-5.
Other Relevant Information:	None.

2. Relevance of Test Material to Proposed Formulation(s):

The test product used in this study was EH-1358 herbicide, containing 11.98% DMA salt of 2,4-D, 4.55% DMA salt of MCPP-p, and 1.54% DMA salt of dicamba. A label was not provided with the Study Report and Versar was not able to locate a label on EPA's PPLS website.

B. STUDY DESIGN:

The study protocol (BTH TFR TF 002), signed on April 21, 1998, was provided with the Study Report. There were four amendments to the protocol and two reported protocol deviations. The protocol amendments involved: (1) providing specific procedures for sample analysis; (2) changing the analysis method for tank mixes; (3) adding a dilution step to the new analysis method for tank mixes; and (4) correcting chemical names and CAS numbers reported in the protocol. The protocol deviations involved: (1) containers of the test substance were incorrectly labeled with expiration date and % ingredients and (2) standard preparation forms were not reviewed within the required 5 working days.

1. Site Description:

Test locations:	The field phase of the study was conducted near Louisburg, NC (NAFTA Region 2). The test site was said to be representative of typical growing areas for turf with respect to soil type and climate. One control plot and three treated plots, divided into forty-six replicate subplots each, were established at the test site. According to a diagram included in the report, the treated plots were located approximately 444 feet from the control plot.
Areas sprayed and sampled:	The treated plots measured 20 ft x 85 ft. The treated plots were split into 46 subplots measuring 3.5 x 5 ft. An 8 ft buffer was established between subplots 1-23 and 24-46.

Meteorological Data:	Daily average minimum and maximum temperatures and precipitation amounts were provided for the day prior to application through the last sampling interval (April 28, 1998 through May 13, 1998). Historical meteorological data were not provided with the study report; therefore, it is not certain if temperatures and precipitation were comparable to the 10-year historical average weather data. Irrigation use was not reported. Temperatures ranged from 34.55-81.40 °F and total monthly rainfall was 1.42 inches. Rainfall occurred on days 2 (0.17 inches), 3 (0.46 inches), 4 (0.03 inches), 5 (0.27 inches), 9 (0.37 inches), and 12 (0.12 inches) after treatment.

2. Surface Monitored:

Turf Species:	Tall fescue and Kentucky blue grass: Tall fescue varieties: Apache II (39.96%), Tomahawk (29.55%), Sahara (15.27%), and Tar Heel (8.94%); Kentucky blue grass Variety: Challenger (9.86%); planted September 28, 1997.
Residential or Public Area:	Not reported.
Other relevant characteristics:	The plots were mowed to a height of 2 inches on two occasions: 2 days prior to application and immediately after the 10 DAT sampling.
Other products used on turf:	Maintenance chemicals and fertilizers were not applied to the test plot during the trial period. The plots were treated with pendimethalin (3.6 pints/A) on March 31, 1998 (29 days prior to application).

3. Physical State of Formulation as Applied:

EH-1358 Herbicide is a multiple active ingredient (MAI) suspension concentrate/liquid (SC/L) formulation.

4. Application Rates and Regimes:

Application rate(s):	The target application rate was 1.760 lb ae/A 2,4-D DMA + 0.601 lb ae/A MCPP-p DMA + 0.200 lb ae/A dicamba DMA, which was the reported proposed maximum label rate for use on turf. The actual application rates were 1.751-1.786 lb ae/A 2,4-D DMA, 0.658-0.671 lb ae/A MCPP-p DMA, and 0.218-0.222 lb ae/A dicamba DMA. This was 99.5-112% of the target rate.
Application Regime:	One broadcast spray application was made to each treated plot on April 29, 1998.
Application Equipment:	The test substance was applied using a tractor mounted sprayer equipped with a spray boom containing twelve nozzles spaced 20 inches apart on the back of the sprayer.

Spray Volume:	The treated plots were each treated with a different spray volume. A spray volume of approximately 2 gallons per acre (GPA) was used for the application at plot 2, a spray volume of 5 GPA was used at plot 3, and a spray volume of 20 GPA was used at plot 4.
Equipment Calibration Procedures:	The sprayer was calibrated prior to application by the volume/time method. The calibration date was not reported.
Was application "watered in"?	The application was not watered in.
Was total deposition measured?	Total deposition was not measured during this study.

5. <u>Transferable Residue Sampling Procedures</u>:

Method and Equipment:	Cloth dosimeter samples were collected from the treated plot using the modified California cloth roller technique, following the Outdoor Residential Exposure Task Force (ORETF) recommendations. Sampling equipment included the modified California roller (32 pounds), sampling media frame, 27 x 39 inch cloth dosimeters (actual 24.5 x 36 inch sample area or 5,691 cm^2) and disposable plastic sheeting.
Sampling Procedure:	Transferable turf samples were collected from randomly selected subplots. Samples were obtained using the modified California cloth roller technique which utilizes a 32 lb roller, which is rolled 5 times over the cloth dosimeter. The dosimeter is in contact with the turf and separated from the roller by disposable plastic sheeting. After rolling, the cloth dosimeter was removed and the sheet was then folded to keep the exposed surface on the inside and placed in labeled plastic zip-lock bags.
Surface area(s) sampled:	The surface area of the cloth dosimeters which came in contact with the treated turf when placed in the sampling frame was 5,691 cm^2.
Replicates per surface:	
– Replicates per sampling time:	At each sampling interval, three treated replicate samples were collected from the treated plots and one sample was collected from the control plots.
– Number of sampling times:	There were a total of 12 sampling events, including one sampling event before the application.
Times of sampling:	Samples were collected prior to the test substance then after application when the spray had dried, at 8-12 hours post-application, and at 1, 2, 3, 4, 5, 6, 7, 10, and 14 days post-application.

6. <u>Sample Handling</u>:

After collection, each sample was carefully folded with the exposed sides together, and placed in a zip-lock bag. The samples were stored frozen (interval between collection and freezing not reported) and then shipped within 6 days via Federal Express on dry ice to Covance Laboratories for analysis, where they were maintained under frozen conditions until extraction and analysis. At Covance, the samples were placed in freezers and maintained frozen (-30 to -10 ° C) until analysis.

The field portion of the study was conducted between April 21, 1998 and May 14, 1998. All analyses were conducted at Covance Laboratories between May 12, 1998 and June 10, 1998. Treated samples were stored for 19 to 39 days prior to analysis.

7. Analytical Methodology:

Extraction method: Residues in the cloth dosimeter samples were extracted and analyzed using a GC/MSD method. Briefly, the residues were extracted from the cloth using acidic acetone. An aliquot of the extract was concentrated, made acidic, and extracted with dichloromethane. The dichloromethane was concentrated and methylated with diazomethane. Residues in the methylated fraction were determined by GC/MSD.

Detection methods: All samples were analyzed using gas chromatography with a mass selective detector (GC/MSD). A summary of the GC/MSD conditions are shown in Table 1.

Table 1. Typical GC/MSD Instrument Parameters

Instrument:	Hewlett-Packard 5890 Gas chromatograph/Model 5970 Mass selective detector
Column:	30 m x 0.25 mm i.d., 0.25 µm film thickness
Injection Volume:	2 µl
Carrier Gas:	Ultra high purity helium
Flow Rate:	1 ml/minute
Temperatures:	Injector: 225°C Transfer line: 280°C Column: Initial: 90°C Rate: 8°C/min Final: 280°C
Expected Retention Times:	Not Reported
Run Time:	Not Reported

Method validation: The method was validated under Covance Study 6926-102, MRID 446557-04. When looking at a combined active ingredient compound with the same combination as used in this study, a mean recovery of 2,4-D, MCPP, and dicamba was 90.0%, 102%, and 98.2%, respectively was determined. The validated limit of quantitation (LOQ) was 0.000879 µg/cm^2; the limit of detection (LOD) was not reported.

Instrument performance: A five-point calibration curve ranging from 0.0400 to 0.800 µg/mL was prepared by injecting constant volumes of calibration standard solutions.

The calibration curve was created based on linear regression. Additional standards were analyzed through the course of the analysis to ensure the validity of the response curve.

Quantification: Quantitation of residues in all samples was achieved by using a calibration curve calculated by linear regression of instrument responses for each of the reference substances at multiple concentrations.

8. Quality Control:

Lab Recovery: Concurrent laboratory fortified samples were analyzed with each set of field samples. Control cloth samples were fortified with 2,4-D, MCPP, and dicamba at nominal concentrations ranging from 0.000879 to 0.351 $\mu g/cm^2$. Individual concurrent laboratory recoveries ranged from 65.0% to 110% with an overall mean recovery of 83.6% ± 12.3% (n= 24) for 2,4-D, from 76.7% to 111% with an overall mean recovery of 93.5% ± 10.6% (n= 24) for MCPP, and from 55.0% to 107% with an overall mean recovery of 84.7% ± 14.7% (n= 24) for dicamba.

Field blanks: One control sample was collected at each sampling interval from the untreated plots. There were no quantifiable residues of 2,4-D, MCPP, or dicamba in any of the untreated control samples.

Field recovery: Field fortification samples were prepared at two concentrations using control cloth dosimeters fortified with 2,4-D, MCPP, or dicamba. The samples were prepared prior to application and 6 days after application. The nominal fortification levels were 0.004 $\mu g/cm^2$ and 0.04 $\mu g/cm^2$. These samples were prepared at the test site, stored frozen and analyzed with the test samples. The cloths for the pre-application event fortifications were rolled over the grass prior to fortification, while the 6DAT fortification cloth was pristine when fortified. None of the samples were "weathered" prior to frozen storage.

Table 2 provides a summary of the field fortification recoveries. At the 0.004 $\mu g/cm^2$ level, the overall mean field fortification recoveries for 2,4-D, MCPP, and dicamba were 89.7±7.18%, 94.3±2.68%, and 79.4±3.57%, respectively. At the 0.04 $\mu g/cm^2$ level, the overall mean field fortification recoveries for 2,4-D, MCPP, and dicamba were 78.8±5.90%, 88.5±4.02%, and 77.2±4.85%, respectively.

Table 2. Summary of Field Fortification								
Analyte	Sampling Interval	Fortification Level ($\mu g/cm^2$)	n	Range of Recoveries[1] (%)	Average Recovery ± Standard Deviation (%)	Overall Average Percent Recovery ± Standard Deviation (%)		
						Low Level	High Level	Overall
2,4-D	-1DAT	0.004	3	91.3-78.4	84.7 ± 6.50	89.7 ± 7.18	78.8 ± 5.90	84.2 ± 8.45
		0.04	3	75.6-84.5	79.3 ± 4.61			
	6DAT	0.004	3	92.3-98.9	94.6 ± 3.69			
		0.04	3	69.0-83.6	78.3 ± 8.05			
MCPP	-1DAT	0.004	3	91.3-98.6	95.4 ± 3.73	94.3 ± 2.68	88.5 ± 4.02	91.4 ± 4.45
		0.04	3	85.2-91.8	88.8 ± 3.36			
	6DAT	0.004	3	92.7-93.6	93.2 ± 0.46			
		0.04	3	82.0-91.8	88.2 ± 5.36			
Dicamba	-1DAT	0.004	3	77.1-86.1	80.7 ± 4.76	79.4 ± 3.57	77.2 ± 4.85	78.3 ± 4.22
		0.04	3	76.9-84.5	79.6 ± 4.23			
	6DAT	0.004	3	76.2-80.2	78.1 ± 2.04			
		0.04	3	69.2-77.8	74.7 ± 4.75			

[1] Recoveries calculated by reviewer using raw data.

Formulation: EH-1358 Herbicide is a multiple active ingredient (MAI) suspension concentrate/liquid (SC/L) formulation containing 11.98% 2,4-D DMA (0.88 lb ae/gallon), 4.55% MCPP-p DMA (0.33 lb ae/gallon), and 1.54% dicamba DMA (0.11 lb ae/gallon).

Tank mix: A tank mix analysis was conducted as part of this study. A single sample was collected from the spray tank after the application of each treatment. The samples were placed in sealed amber glass bottles and stored refrigerated prior to shipment. The tank mix sample was shipped to the analytical laboratory, stored refrigerated, and analyzed using GC/MSD. Tank mix samples ranged from 7,640 to 119,000 µg/mL (72-113% of theoretical) for 2,4-D, 3,360 to 47,000 µg/mL (85-119% of theoretical) for MCPP, and 1,020 to 13,700 µg/mL (77-104% of theoretical) for dicamba.

Travel Recovery: Travel recovery samples were not used in this study.

Storage Stability: A separate storage stability study was not conducted. However, the field-fortified samples were stored and shipped under the same conditions as the field samples and were used to provide storage stability data for the treated samples.

II. RESULTS AND CALCULATIONS

The Registrant provided TTRs in ng/cm^2. The Registrant did not correct the data for field fortification recoveries. Versar corrected the TTRs using the average field fortification recoveries from each site. Residues ≤0.0241 (0.0245 for dicamba) $\mu g/cm^2$ were corrected for the average low level field fortification recovery (89.7% for 2,4-D, 94.3% for MCPP, and 79.4% for dicamba) and residues >0.0241 (0.0245) $\mu g/cm^2$ were corrected for the average high level field fortification recovery (78.8% for 2,4-D, 88.5% for MCPP, and 77.2% for dicamba DMA). TTR values reported as below the LOQ were assigned a value of ½ LOQ.

TTR values calculated by Versar are provided in Tables 3-5, 6-8, and 9-11 for 2,4-D DMA, MCPP-p DMA, and dicamba, respectively.

The highest average TTR value generally occurred immediately after the application (0DAT) and dropped to below the LOQ by 2DAT (MCPP TRT 4 plots; dicamba all plots), 3DAT (2,4-D TRT 3 and 4 plots; MCPP TRT 2 and 3 plots), or 5DAT (2,4-D TRT 2 plot); the highest average TTR value for the 2,4-D and dicamba TRT 4 (20 GPA) plots occurred 8 hrs after treatment.

The highest average TTR residues occurred from TRT 3 (5 GPA) followed by TRT 2 (2 GPA). For TRT 2 (2 GPA), the highest average TTR values (and percent of application rate) were 0.194 $\mu g/cm^2$ (0.976%) for 2,4-D, 0.078 $\mu g/cm^2$ (1.054%) for MCPP, and 0.027 $\mu g/cm^2$ (1.088%) for dicamba. For TRT 3 (5 GPA), the highest average TTR values (and percent of application rate) were 0.249 $\mu g/cm^2$ (1.242%) for 2,4-D, 0.090 $\mu g/cm^2$ (1.200%) for MCPP, and 0.036 $\mu g/cm^2$ (1.445%) for dicamba. For TRT 4 (20 GPA), the highest average TTR values (and percent of application rate) were 0.171 $\mu g/cm^2$ (0.873%) for 2,4-D, 0.051 $\mu g/cm^2$ (0.690%) for MCPP, and 0.028 $\mu g/cm^2$ (1.128%) for dicamba.

The Registrant generated dissipation curves assuming a first order degradation of the natural log transformed data. The analysis was conducted using the average TTR values collected immediately after application through 1DAT (MCPP and dicamba TRT 3 and 4), 2DAT (2,4-D TRT 3 and 4; dicamba TRT 2), or 4DAT (2,4-D and MCPP TRT 2). The Registrant's calculated half-lives for 2,4-D in turf were 0.5 days ($R^2 = 0.716$) for TRT 2 (2 GPA), 0.2 days ($R^2 = 0.914$) for TRT 3 (5 GPA), and 0.3 days ($R^2 = 0.945$) for TRT 4 (20 GPA). The Registrant's calculated half-lives for MCPP in turf were 0.5 days ($R^2 = 0.770$) for TRT 2 (2 GPA), 0.5 days ($R^2 = 0.941$) for TRT 3 (5 GPA), and 0.4 days ($R^2 = 0.928$) for TRT 4 (20 GPA). The Registrant's calculated half-lives for dicamba in turf were 0.4 days ($R^2 = 0.648$) for TRT 2 (2 GPA), 0.5 days ($R^2 = 0.951$) for TRT 3 (5 GPA), and 0.4 days ($R^2 = 0.816$) for TRT 4 (20 GPA).

Versar assumed first-order dissipation kinetics to generate dissipation curves for 2,4-D, MCPP, and dicamba. Versar conducted the linear regression analysis using the natural logarithm of the individual foliar residue values collected immediately after the application through 2DAT (MCPP TRT 3 and 4; dicamba all treatments), 3DAT (2,4-D TRT 3 and 4; MCPP TRT 2), or 5 DAT (2,4-D TRT 2). Based on linear regression of the natural log transformed data, Versar's calculated half-lives for 2,4-D in turf were 0.54 days ($R^2 = 0.707$) for TRT 2 (2 GPA), 0.29 days ($R^2 = 0.903$) for TRT 3 (5 GPA), and 0.32 days ($R^2 = 0.963$) for TRT 4 (20 GPA). Versar's calculated half-lives for MCPP in turf were 0.37 days ($R^2 = 0.796$) for TRT 2 (2 GPA), 0.27 days ($R^2 = 0.933$) for TRT 3 (5 GPA), and 0.28 days ($R^2 = 0.966$) for TRT 4 (20 GPA). Versar's calculated half-lives for dicamba in turf were 0.38 days ($R^2 = 0.623$) for TRT 2 (2 GPA), 0.32 days ($R^2 = 0.935$) for TRT 3 (5 GPA), and 0.33 days ($R^2 = 0.943$) for TRT 4 (20 GPA).

A graphical representation of 2,4-D, MCPP, and dicamba residue dissipation after treatment is presented in Figures 1, 2, and 3, respectively. Tables 12-14 provide a summary of the regression statistics for all three analytes.

III DISCUSSION:

A. LIMITATIONS OF THE STUDY:

This study met the majority of the Series 875.2100 Guidelines. The following issues of concern are noted:

- The registrant did not correct residues using field fortification recovery data. Average low

level field fortification recovery was 89.7%, 94.3%, and 79.4%, respectively, for 2,4-D DMA, MCPP-p DMA, and dicamba DMA. Average high level field fortification recovery was 78.8%, 88.5%, and 77.2%, respectively, for 2,4-D, MCPP-p, and dicamba.

- The field fortification levels (0.004 and 0.04 $\mu g/cm^2$) did not bracket the field sample TTR values found on cloth dosimeters. Field study TTR values ranged from <LOQ (0.000897 $\mu g/cm^2$) to 0.270 $\mu g/cm^2$.

- The cotton matrix used in the field fortification samples was not "weathered" as is customary to simulate actual field sample collection. The cloths for the pre-application event fortifications were rolled over the grass prior to fortification, while the 6DAT fortification cloth was pristine when fortified.

- The production of metabolites, breakdown products, or the presence of contaminants of concern were not discussed in the Study Report.

- Turf transferable residue (TTR) data from this study are based on sampling from one test site only.

- Rainfall occurred on days 2 (0.17 inches), 3 (0.46 inches), 4 (0.03 inches), 5 (0.27 inches), 9 (0.37 inches), and 12 (0.12 inches) after treatment.

- A product label was not included with the study report; therefore, it is not certain if the maximum application rate, minimum retreatment interval, and accurate spray volume were used.

- Only temperature and precipitation data were provided for the duration of the study. Wind velocity was provided for the day of application.

B. CONCLUSIONS:

The half-life values calculated by the Registrant were similar to the ones calculated by Versar. In addition, half-life values of the same analyte applied at different application volumes were similar. Summaries of the regression statistics calculated by Versar are presented in Tables 12-14.

Table 3. 2,4-D TTRs for North Carolina Turf Treated with EH-1358 Herbicide – TRT 2 (2 GPA)[1]								
Sample Interval	Turf Transferable Residue[2] (µg/cm^2)	Corrected Residue Level[3] (µg/cm^2)	Arithmetic Mean (µg/cm^2)	Standard Deviation (µg/cm^2)	Coefficient of Variance (%)	Natural Log of Mean (µg/cm^2)	Geomean (µg/cm^2)	% original app rate transferred
0DAT	0.0868	0.1101	0.1940	0.1290	66.5	-1.64	0.170	0.976
	0.2700	0.3426						
	0.1020	0.1294						
8-12 hr DAT	0.0955	0.1212	0.0905	0.0267	29.4	-2.40	0.088	0.456
	0.0615	0.0780						
	0.0571	0.0724						
1DAT	0.2100	0.2664	0.2292	0.0351	15.3	-1.47	0.227	1.153
	0.1550	0.1967						
	0.1770	0.2246						
2DAT	0.0016	0.0018	0.0009	0.0008	87.8	-7.02	0.001	0.004
	<LOQ	0.0004						
	<LOQ	0.0004						
3DAT	<LOQ	0.0004	0.0006	0.0004	55.0	-7.35	0.001	0.003
	0.0009	0.0011						
	<LOQ	0.0004						
4DAT	0.0014	0.0015	0.0016	0.0003	18.6	-6.42	0.002	0.008
	0.0018	0.0020						
	0.0013	0.0014						
5DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
6DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
7DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
10DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
14DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						

Note: Rainfall occurred on days 2 (0.17 inches), 3 (0.46 inches), 4 (0.03 inches), 5 (0.27 inches), 9 (0.37 inches), and 12 (0.12 inches) after treatment.

1. One application was made at a rate of 1.8 lb ae/A (approx. 19.9 µg/cm^2).
2. LOQ = 0.000879 µg/cm^2. For statistical calculations, residues <LOQ were assigned a value of ½ LOQ.
3. Residues ≤0.024145 µg/cm^2 were corrected for the average low level field fortification recovery (89.7%) and residues >0.024145 µg/cm^2 were corrected for the average high level field fortification recovery (78.8%).
4. Percent of Original App. Rate Transferred = TTR corrected (µg/cm^2) / Amount applied (µg/cm^2) x 100%.

Table 4. 2,4-D TTRs for North Carolina Turf Treated with EH-1358 Herbicide – TRT 3 (5 GPA)[1]								
Sample Interval	Turf Transferable Residue[2] (µg/cm^2)	Corrected Residue Level[3] (µg/cm^2)	Arithmetic Mean (µg/cm^2)	Standard Deviation (µg/cm^2)	Coefficient of Variance (%)	Natural Log of Mean (µg/cm^2)	Geomean (µg/cm^2)	% original app rate transferred
0DAT	0.2470	0.3131	0.2487	0.0641	25.8	-1.39	0.243	1.242
	0.1950	0.2474						
	0.1460	0.1852						
8-12 hr DAT	0.1320	0.1675	0.1316	0.0338	25.7	-2.03	0.129	0.657
	0.1000	0.1269						
	0.0791	0.1004						
1DAT	0.0556	0.0705	0.0007	0.0004	58.6	-7.32	0.001	0.003
	0.0327	0.0415						
	0.0758	0.0962						
2DAT	0.0010	0.0011	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
3DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
4DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
5DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
6DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
7DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
10DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
14DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						

Note: Rainfall occurred on days 2 (0.17 inches), 3 (0.46 inches), 4 (0.03 inches), 5 (0.27 inches), 9 (0.37 inches), and 12 (0.12 inches) after treatment.

1. One application was made at a rate of 1.8 lb ae/A (approx. 20.0 µg/cm^2).
2. LOQ = 0.000879 µg/cm^2. For statistical calculations, residues <LOQ were assigned a value of ½ LOQ.
3. Residues ≤0.024145 µg/cm^2 were corrected for the average low level field fortification recovery (89.7%) and residues >0.024145 µg/cm^2 were corrected for the avg. high level field fortification recovery (78.8%).
4. Percent of Original App. Rate Transferred = TTR corrected (µg/cm^2) / Amount applied (µg/cm^2) x 100%.

Table 5. 2,4-D TTRs for North Carolina Turf Treated with EH-1358 Herbicide – TRT 4 (20 GPA)[1]								
Sample Interval	Turf Transferable Residue[2] (µg/cm^2)	Corrected Residue Level[3] (µg/cm^2)	Arithmetic Mean (µg/cm^2)	Standard Deviation (µg/cm^2)	Coefficient of Variance (%)	Natural Log of Mean (µg/cm^2)	Geomean (µg/cm^2)	% original app rate transferred
0DAT	0.1400	0.1776	0.1588	0.0284	17.9	-1.84	0.157	0.809
	0.0994	0.1261						
	0.1360	0.1726						
8-12 hr DAT	0.1220	0.1548	0.1713	0.0253	14.8	-1.76	0.170	0.873
	0.1580	0.2005						
	0.1250	0.1586						
1DAT	0.0289	0.0367	0.0450	0.0112	24.8	-3.10	0.044	0.229
	0.0321	0.0407						
	0.0455	0.0577						
2DAT	0.0017	0.0018	0.0016	0.0002	14.6	-6.42	0.002	0.008
	0.0012	0.0014						
	0.0015	0.0017						
3DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
4DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
5DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
6DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
7DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
10DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						
14DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.002
	<LOQ	0.0004						
	<LOQ	0.0004						

Note: Rainfall occurred on days 2 (0.17 inches), 3 (0.46 inches), 4 (0.03 inches), 5 (0.27 inches), 9 (0.37 inches), and 12 (0.12 inches) after treatment.

1. One application was made at a rate of 1.8 lb ae/A (approx. 19.6 µg/cm^2).
2. LOQ = 0.000879 µg/cm^2. For statistical calculations, residues <LOQ were assigned a value of ½ LOQ.
3. Residues ≤0.024145 µg/cm^2 were corrected for the average low level field fortification recovery (89.7%) and residues >0.024145 µg/cm^2 were corrected for the avg. high level field fortification recovery (78.8%).
4. Percent of Original App. Rate Transferred = TTR corrected (µg/cm^2) / Amount applied (µg/cm^2) x 100%.

Table 6. MCPP TTRs for North Carolina Turf Treated with EH-1358 Herbicide – TRT 2 (2 GPA)[1]								
Sample Interval	Turf Transferable Residue[2] (µg/cm^2)	Corrected Residue Level[3] (µg/cm^2)	Arithmetic Mean (µg/cm^2)	Standard Deviation (µg/cm^2)	Coefficient of Variance (%)	Natural Log of Mean (µg/cm^2)	Geomean (µg/cm^2)	% original app rate transferred
0DAT	0.0356	0.0402	0.0782	0.0541	69.2	-2.55	0.067	1.054
	0.1240	0.1401						
	0.0480	0.0542						
8-12 hr DAT	0.0361	0.0408	0.0306	0.0090	29.3	-3.49	0.030	0.413
	0.0242	0.0273						
	0.0224	0.0238						
1DAT	0.0815	0.0921	0.0774	0.0128	16.5	-2.56	0.077	1.044
	0.0606	0.0685						
	0.0635	0.0718						
2DAT	0.0009	0.0010	0.0006	0.0003	50.3	-7.39	0.001	0.008
	<LOQ	0.0004						
	<LOQ	0.0004						
3DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
4DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
5DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
6DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
7DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
10DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
14DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						

Note: Rainfall occurred on days 2 (0.17 inches), 3 (0.46 inches), 4 (0.03 inches), 5 (0.27 inches), 9 (0.37 inches), and 12 (0.12 inches) after treatment.

1. One application was made at a rate of 0.67 lb ae/A (approx. 7.4 µg/cm^2).
2. LOQ = 0.000879 µg/cm^2. For statistical calculations, residues <LOQ were assigned a value of ½ LOQ.
3. Residues ≤0.024145 µg/cm^2 were corrected for the average low level field fortification recovery (94.3%) and residues >0.024145 µg/cm^2 were corrected for the avg. high level field fortification recovery (88.5%).
4. Percent of Original App. Rate Transferred = TTR corrected (µg/cm^2) / Amount applied (µg/cm^2) x 100%.

5.

Table 7. MCPP TTRs for North Carolina Turf Treated with EH-1358 Herbicide – TRT 3 (5 GPA)[1]

Sample Interval	Turf Transferable Residue[2] (µg/cm²)	Corrected Residue Level[3] (µg/cm²)	Arithmetic Mean (µg/cm²)	Standard Deviation (µg/cm²)	Coefficient of Variance (%)	Natural Log of Mean (µg/cm²)	Geomean (µg/cm²)	% original app rate transferred
0DAT	0.0966	0.1092	0.0902	0.0214	23.7	-2.41	0.088	1.200
	0.0837	0.0946						
	0.0593	0.0670						
8-12 hr DAT	0.0503	0.0568	0.0428	0.0130	30.3	-3.15	0.041	0.568
	0.0355	0.0401						
	0.0277	0.0313						
1DAT	0.0174	0.0185	0.0205	0.0111	54.1	-3.89	0.019	0.273
	0.0100	0.0106						
	0.0288	0.0325						
2DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
3DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
4DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
5DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
6DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
7DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
10DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
14DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						

Note: Rainfall occurred on days 2 (0.17 inches), 3 (0.46 inches), 4 (0.03 inches), 5 (0.27 inches), 9 (0.37 inches), and 12 (0.12 inches) after treatment.

1. One application was made at a rate of 0.67 lb ae/A (approx. 7.5 µg/cm²).
2. LOQ = 0.000879 µg/cm². For statistical calculations, residues <LOQ were assigned a value of ½ LOQ.
3. Residues ≤0.024145 µg/cm² were corrected for the average low level field fortification recovery (94.3%) and residues >0.024145 µg/cm² were corrected for the avg. high level field fortification recovery (88.5%).
4. Percent of Original App. Rate Transferred = TTR corrected (µg/cm²) / Amount applied (µg/cm²) x 100%.

Table 8. MCPP TTRs for North Carolina Turf Treated with EH-1358 Herbicide – TRT 4 (20 GPA)[1]								
Sample Interval	Turf Transferable Residue[2] (µg/cm^2)	Corrected Residue Level[3] (µg/cm^2)	Arithmetic Mean (µg/cm^2)	Standard Deviation (µg/cm^2)	Coefficient of Variance (%)	Natural Log of Mean (µg/cm^2)	Geomean (µg/cm^2)	% original app rate transferred
0DAT	0.0532	0.0601	0.0509	0.0104	20.4	-2.98	0.050	0.690
	0.0351	0.0397						
	0.0469	0.0530						
8-12 hr DAT	0.0411	0.0464	0.0485	0.0059	12.2	-3.03	0.048	0.657
	0.0488	0.0551						
	0.0388	0.0438						
1DAT	0.0066	0.0070	0.0087	0.0020	23.2	-4.74	0.009	0.118
	0.0078	0.0082						
	0.0103	0.0109						
2DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
3DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
4DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
5DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
6DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
7DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
10DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						
14DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.006
	<LOQ	0.0004						
	<LOQ	0.0004						

Note: Rainfall occurred on days 2 (0.17 inches), 3 (0.46 inches), 4 (0.03 inches), 5 (0.27 inches), 9 (0.37 inches), and 12 (0.12 inches) after treatment.

1. One application was made at a rate of 0.67 lb ae/A (approx. 7.4 µg/cm^2).
2. LOQ = 0.000879 µg/cm^2. For statistical calculations, residues <LOQ were assigned a value of ½ LOQ.
3. Residues ≤0.024145 µg/cm^2 were corrected for the average low level field fortification recovery (94.3%) and residues >0.024145 µg/cm^2 were corrected for the avg. high level field fortification recovery (88.5%).
4. Percent of Original App. Rate Transferred = TTR corrected (µg/cm^2) / Amount applied (µg/cm^2) x 100%.

Table 9. Dicamba TTRs for North Carolina Turf Treated with EH-1358 Herbicide – TRT 2 (2 GPA)[1]								
Sample Interval	Turf Transferable Residue[2] (µg/cm^2)	Corrected Residue Level[3] (µg/cm^2)	Arithmetic Mean (µg/cm^2)	Standard Deviation (µg/cm^2)	Coefficient of Variance (%)	Natural Log of Mean (µg/cm^2)	Geomean (µg/cm^2)	% original app rate transferred
0DAT	0.0110	0.0139	0.0271	0.0191	70.6	-3.61	0.023	1.088
	0.0378	0.0490						
	0.0146	0.0184						
8-12 hr DAT	0.0121	0.0152	0.0119	0.0029	24.5	-4.43	0.012	0.478
	0.0080	0.0100						
	0.0083	0.0104						
1DAT	0.0314	0.0407	0.0355	0.0078	21.9	-3.34	0.035	1.427
	0.0211	0.0266						
	0.0303	0.0393						
2DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
3DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
4DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
5DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
6DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
7DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
10DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
14DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						

Note: Rainfall occurred on days 2 (0.17 inches), 3 (0.46 inches), 4 (0.03 inches), 5 (0.27 inches), 9 (0.37 inches), and 12 (0.12 inches) after treatment.

1. One application was made at a rate of 0.22 lb ae/A (approx. 2.5 µg/cm^2).
2. LOQ = 0.000879 µg/cm^2. For statistical calculations, residues <LOQ were assigned a value of ½ LOQ.
3. Residues ≤0.024475 µg/cm^2 were corrected for the average low level field fortification recovery (79.4%) and residues >0.024475 µg/cm^2 were corrected for the avg. high level field fortification recovery (77.2%).
4. Percent of Original App. Rate Transferred = TTR corrected (µg/cm^2) / Amount applied (µg/cm^2) x 100%.

Table 10. Dicamba TTRs for North Carolina Turf Treated with EH-1358 Herbicide – TRT 3 (5 GPA)[1]								
Sample Interval	Turf Transferable Residue[2] (µg/cm²)	Corrected Residue Level[3] (µg/cm²)	Arithmetic Mean (µg/cm²)	Standard Deviation (µg/cm²)	Coefficient of Variance (%)	Natural Log of Mean (µg/cm²)	Geomean (µg/cm²)	% original app rate transferred
0DAT	0.0327	0.0424	0.0360	0.0088	24.4	-3.33	0.035	1.445
	0.0305	0.0395						
	0.0206	0.0260						
8-12 hr DAT	0.0192	0.0242	0.0181	0.0055	30.5	-4.01	0.018	0.729
	0.0134	0.0169						
	0.0106	0.0134						
1DAT	0.0068	0.0086	0.0093	0.0053	57.1	-4.68	0.008	0.373
	0.0035	0.0043						
	0.0118	0.0149						
2DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
3DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
4DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
5DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
6DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
7DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
10DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
14DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						

Note: Rainfall occurred on days 2 (0.17 inches), 3 (0.46 inches), 4 (0.03 inches), 5 (0.27 inches), 9 (0.37 inches), and 12 (0.12 inches) after treatment.

1. One application was made at a rate of 0.22 lb ae/A (approx. 2.5 µg/cm²).
2. LOQ = 0.000879 µg/cm². For statistical calculations, residues <LOQ were assigned a value of ½ LOQ.
3. Residues ≤0.024475 µg/cm² were corrected for the average low level field fortification recovery (79.4%) and residues >0.024475 µg/cm² were corrected for the avg. high level field fortification recovery (77.2%).
4. Percent of Original App. Rate Transferred = TTR corrected (µg/cm²) / Amount applied (µg/cm²) x 100%.

Table 11. Dicamba TTRs for North Carolina Turf Treated with EH-1358 Herbicide – TRT 4 (20 GPA)[1]								
Sample Interval	Turf Transferable Residue[2] (µg/cm²)	Corrected Residue Level[3] (µg/cm²)	Arithmetic Mean (µg/cm²)	Standard Deviation (µg/cm²)	Coefficient of Variance (%)	Natural Log of Mean (µg/cm²)	Geomean (µg/cm²)	% original app rate transferred
0DAT	0.0189	0.0238	0.0203	0.0039	19.1	-3.90	0.020	0.830
	0.0128	0.0161						
	0.0166	0.0209						
8-12 hr DAT	0.0172	0.0217	0.0276	0.0063	22.9	-3.59	0.027	1.128
	0.0264	0.0342						
	0.0213	0.0268						
1DAT	0.0026	0.0033	0.0042	0.0010	25.1	-5.48	0.004	0.171
	0.0031	0.0039						
	0.0042	0.0053						
2DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
3DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
4DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
5DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
6DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
7DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
10DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						
14DAT	<LOQ	0.0004	0.0004	0.0000	0.00	-7.73	0.000	0.018
	<LOQ	0.0004						
	<LOQ	0.0004						

Note: Rainfall occurred on days 2 (0.17 inches), 3 (0.46 inches), 4 (0.03 inches), 5 (0.27 inches), 9 (0.37 inches), and 12 (0.12 inches) after treatment.

1. One application was made at a rate of 0.22 lb ae/A (approx. 2.4 µg/cm²).
2. LOQ = 0.000879 µg/cm². For statistical calculations, residues <LOQ were assigned a value of ½ LOQ.
3. Residues ≤0.024475 µg/cm² were corrected for the average low level field fortification recovery (79.4%) and residues >0.024475 µg/cm² were corrected for the avg. high level field fortification recovery (77.2%).
4. Percent of Original App. Rate Transferred = TTR corrected (µg/cm²) / Amount applied (µg/cm²) x 100%.

NOTE: The following regression summary tables are based on data collected after the one and only application of EH-1358 herbicide to turfgrass in North Carolina using tractor mounted sprayers. Application rates have been converted to acid equivalents (ae).

Table 12. 2,4-D Summary of Registrant and Versar Regression Analysis for Turf Treated with EH-1358 Herbicide

Statistic	TRT 2 (2 GPA)	TRT 3 (5 GPA)	TRT 4 (20 GPA)
Application Rate (lb ae/A) Target Application Rate = 1.760 lb ae/A	1.773	1.786	1.751
Measured Average Day 0 Residue ($\mu g/cm^2$)	0.194	0.249	0.159
Predicted Day 0 Residue ($\mu g/cm^2$)	0.122	0.280	0.242
Slope	-1.29	-2.37	-2.18
Half-life (days)	0.536	0.293	0.318
R^2	0.707	0.903	0.963
Registrant's predicted half-life (days)	0.5	0.2	0.3
Registrant's R^2	0.716	0.914	0.945

Table 13. MCPP Summary of Registrant and Versar Regression Analysis for Turf Treated with EH-1358 Herbicide

Statistic	TRT 2 (2 GPA)	TRT 3 (5 GPA)	TRT 4 (20 GPA)
Application Rate (lb ae/A) Target Application Rate = 1.760 lb ae/A	0.662	0.671	0.658
Measured Average Day 0 Residue ($\mu g/cm^2$)	0.0782	0.0902	0.0509
Predicted Day 0 Residue ($\mu g/cm^2$)	0.0904	0.115	0.0776
Slope	-1.89	-2.60	-2.49
Half-life (days)	0.367	0.266	0.279
R^2	0.796	0.933	0.966
Registrant's predicted half-life (days)	0.5	0.5	0.4
Registrant's R^2	0.770	0.941	0.928

Table 14. Dicamba Summary of Registrant and Versar Regression Analysis for Turf Treated with EH-1358 Herbicide

Statistic	TRT 2 (2 GPA)	TRT 3 (5 GPA)	TRT 4 (20 GPA)
Application Rate (lb ae/A) Target Application Rate = 1.760 lb ae/A	0.222	0.222	0.218
Measured Average Day 0 Residue ($\mu g/cm^2$)	0.0271	0.036	0.0203
Predicted Day 0 Residue ($\mu g/cm^2$)	0.0362	0.0411	0.0319
Slope	-1.81	-2.15	-2.09
Half-life (days)	0.384	0.323	0.332
R^2	0.623	0.935	0.943
Registrant's predicted half-life (days)	0.4	0.5	0.4
Registrant's R^2	0.648	0.951	0.816

Figure 1. Average 2,4-D TTR After One EH-1358 Herbicide Application

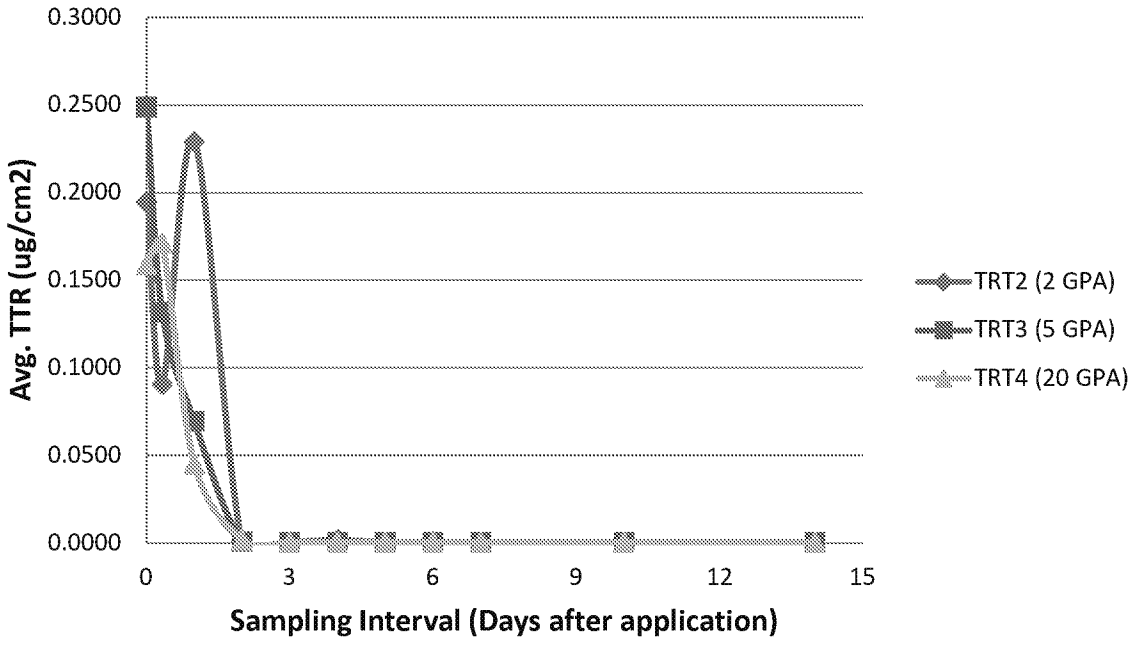
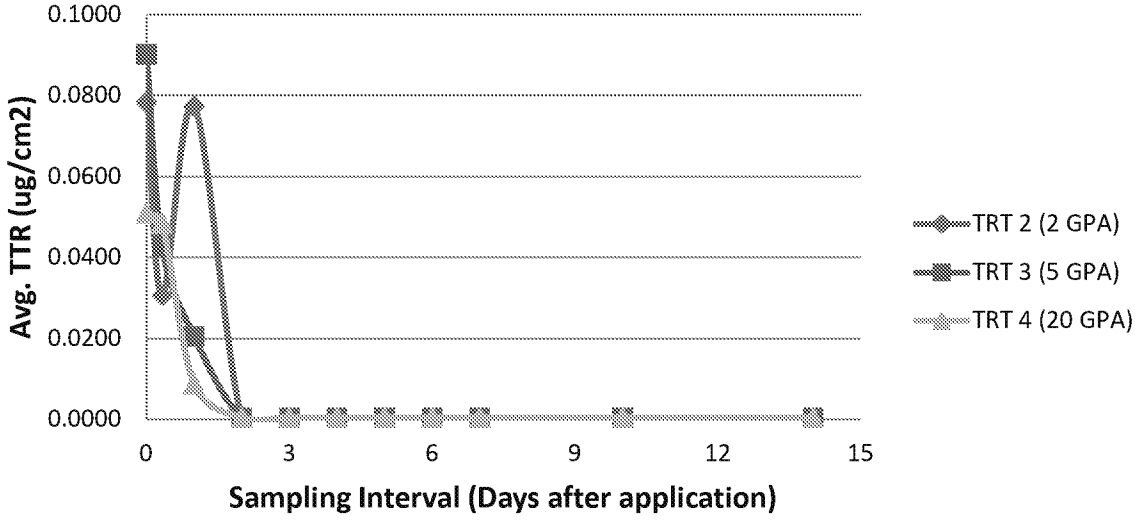


Figure 2. Average MCPP TTR After One EH-1358 Herbicide Application



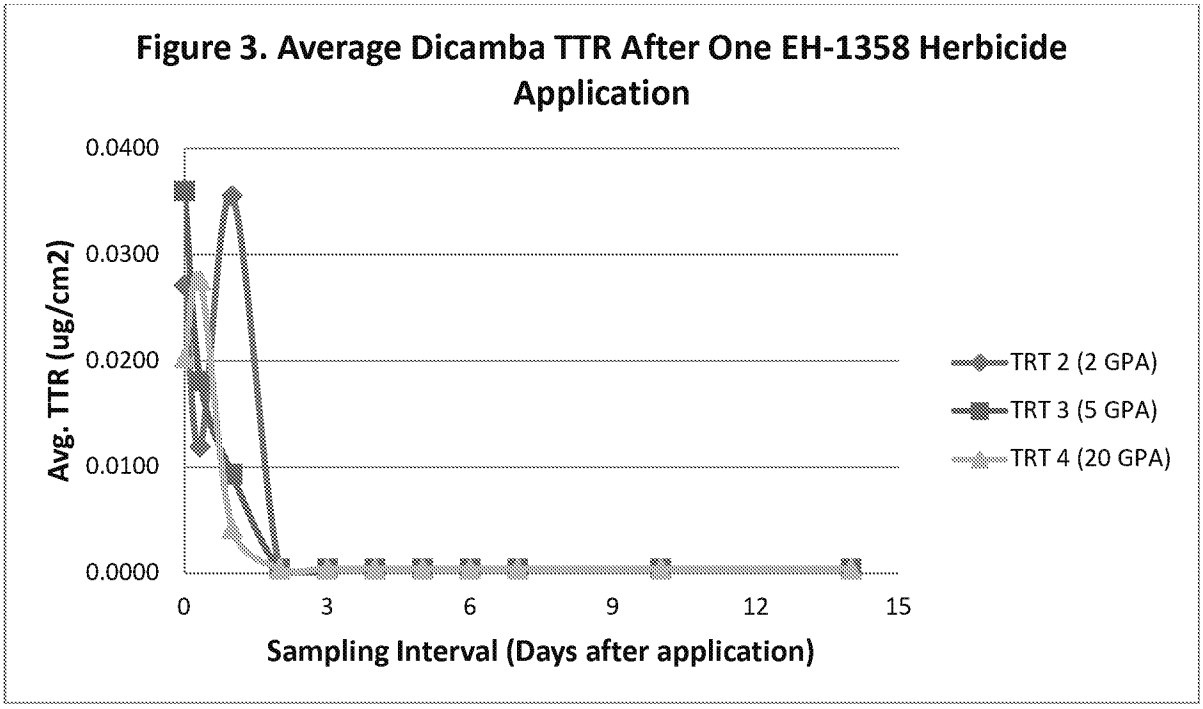


Figure 3. Average Dicamba TTR After One EH-1358 Herbicide Application
0.0400
0.0300
0.0200
0.0100
0.0000
Avg. TTR (ug/cm2)
0
3
6
9
12
15
Sampling Interval (Days after application)
TRT 2 (2 GPA)
TRT 3 (5 GPA)
TRT 4 (20 GPA)

Name:
Evaluator
Occupational Exposure Assessment Section

Date

Name:
Peer Reviewer
Occupational Exposure Assessment Section

Date

Name:
Head,
Occupational Exposure Assessment Section

Date

APPENDIX A

Compliance Checklist for
"Determination of Transferable Turf Residues on Turf Treated with 2,4-D DMA + MCPP-p DMA + Dicamba DMA in Various Spray Volumes"

Compliance Checklist for "Determination of Transferable Turf Residues on Turf Treated with 2,4-D DMA + MCPP-p DMA + Dicamba DMA in Various Spray Volumes"

Compliance with OPPTS Series 875, Occupational and Residential Exposure Test Guidelines, Group B: Post-application Exposure Monitoring Test Guidelines, 875.2100, Transferable Residue Dissipation, Lawn and Turf, is critical. The itemized checklist below describes compliance with most of the major technical aspects of OPPTS 875.2100.

- *The test substance must be the typical end use product of the active ingredient.* This criterion was most likely met. A proposed label was not provided with the study report.

- *The production of metabolites, breakdown products, or the presence of contaminants of concern, should be considered in the study design on a case-by-case basis.* It is not certain if this criterion was met. The study does not provide information on presence or absence of metabolites, breakdown products, or contaminants of potential toxicologic concern.

- *Applications should occur at the time of season that the end-use product is normally applied to achieve intended pest control.* This criterion was most likely met. A proposed label was not provided with the study report.

- *Initiating testing immediately before a precipitation event should be avoided. Applications should be made after mowing and watering.* These criteria were met. The turf was mowed 2 days prior to application. The first rain event occurred after the 2DAT sampling event.

- *The end use product should be applied by the application method recommended. Formulations which can be applied in a minimal amount of water and do not require "watering in" should be used. Information that verifies that the application equipment (e.g., sprayer) was properly calibrated should be included.* These criteria were met.

- *The application rate used in the study should be provided and should be the maximum rate specified on the label. However, monitoring following application at a typical application rate is more appropriate in certain cases.* It is not clear if this criterion was met. A proposed label was not provided.

- *If multiple applications are made, the minimum allowable interval between applications should be used.* This criterion is not applicable, only one application was made.

- *Turf transferable residue (TTR) data should be collected from at least three geographically distinct locations for each formulation. The sites should be representative of the regions (and turf types) where the chemical is used.* This criterion was not met. Data from only one test site (North Carolina) was submitted.

- *The site(s) treated should be representative of reasonable worst-case climatic conditions expected in intended use areas. Meteorological conditions including temperature, wind speed, daily rainfall, and humidity should be provided for the duration of the study.* This criterion was partially met. The registrant does not discuss, and it could not be determined that North Carolina represents worst-case climatic conditions. Wind speed and humidity were not reported.

- *Sampling should be sufficient to characterize the dissipation mechanisms of the compound (e.g., three half-lives or 35 days after the final application, unless the compound has been found to fully dissipate in less time; for more persistent pesticides, longer sampling periods may be necessary). Sampling*

intervals may be relatively short in the beginning and lengthen as the study progresses. Background samples should be collected before application of the test substance occurs. This criterion was met.

- *Triplicate, randomly collected samples should be collected at each sampling interval.* This criterion was met.

- *Samples should be collected using a suitable methodology (e.g., California Cloth Roller, Polyurethane Roller, Drag Sled, etc.) for turf.* This criterion was met. Turf residue samples were collected using the Modified California Roller protocol.

- *Control plots should be established from which sufficient control samples can be collected. Control sites should be upwind and a reasonable distance from the treatment site.* These criteria were met.

- *Residues should be dislodged from turf within a reasonable time period (i.e., EPA recommends that dislodging occur within 4 hours). Other transferable method samples should be handled in a manner that is appropriate to the method used.* This criterion was met. The modified California cloth roller methodology was used in the conduct of this study.

- *Samples should be stored in a manner that will minimize deterioration and loss of analytes between collection and analysis. Information on storage stability should be provided.* These criteria were met. A storage stability study was not performed. However, storage stability of 2,4-D, MCPP, and dicamba during the study period was demonstrated by acceptable analysis of fortified field samples stored and shipped under the same conditions as the field samples.

- *Validated analytical methods of sufficient sensitivity are needed. Information on method efficiency (residue recovery), and limit of quantitation (LOQ) should be provided.* These criteria were most likely met. The limit of quantitation (LOQ) was 0.000879 µg/cm^2. The registrant reported that the method was validated under Covance Study 6926-102; however, further information was not provided.

- *Information on recovery samples must be included in the study report. A complete set of field recoveries should consist of at least one blank control sample and three or more each of a low-level and high-level fortification. These fortifications should be in the range of anticipated residue levels in the field study.* This criterion was partially met. The fortification levels (0.004 and 0.04 µg/cm^2) did not bracket the residue levels found in the field samples; however, they were within an order of magnitude. Field study TTR values ranged from <LOQ (0.000897 µg/cm^2) to 0.270 µg/cm^2.

- *Raw residue data must be corrected for appropriate recovery values...* This criterion was not met. The registrant did not correct for an average low field fortification recovery of 89.7%, 94.3%, and 79.4%, respectively, for 2,4-D, MCPP, and dicamba. The registrant did not correct for an average high field fortification recovery of 78.8%, 88.5%, and 77.2%, respectively, for 2,4-D, MCPP, and dicamba.

- R*esidue data should be expressed as µg/cm^2.* This criterion was not met. Residue data was expressed as ng/cm^2.

APPENDIX B

Regression Analysis Results

Regression Analysis: Summary Output for North Carolina TTR 2,4-D TRT 2

Regression Statistics	
Multiple R	0.841017
R Square	0.70731
Adjusted R^2	0.691905
Standard Error	1.533357
Observations	21

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	107.9549	107.9549	45.915133	1.79768E-06
Residual	19	44.67247	2.351182		
Total	20	152.6273			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-2.10227	0.535419	-3.9264	0.0009065	-3.222913247	-0.981624864
Slope	-1.29301	0.19082	-6.77607	1.798E-06	-1.692397022	-0.893617032

Half Life = 0.536074 Days

Predicted TTR Levels

Time (Days)	Residue (ug/cm2)
0	0.122179
1	0.033531
2	0.009202
3	0.002526
4	0.000693
5	0.00019
6	5.22E-05
7	1.43E-05
8	3.93E-06
9	1.08E-06
10	2.96E-07
11	8.13E-08
12	2.23E-08
13	6.12E-09
14	1.68E-09
15	4.61E-10
16	1.27E-10
17	3.47E-11
18	9.53E-12
19	2.62E-12

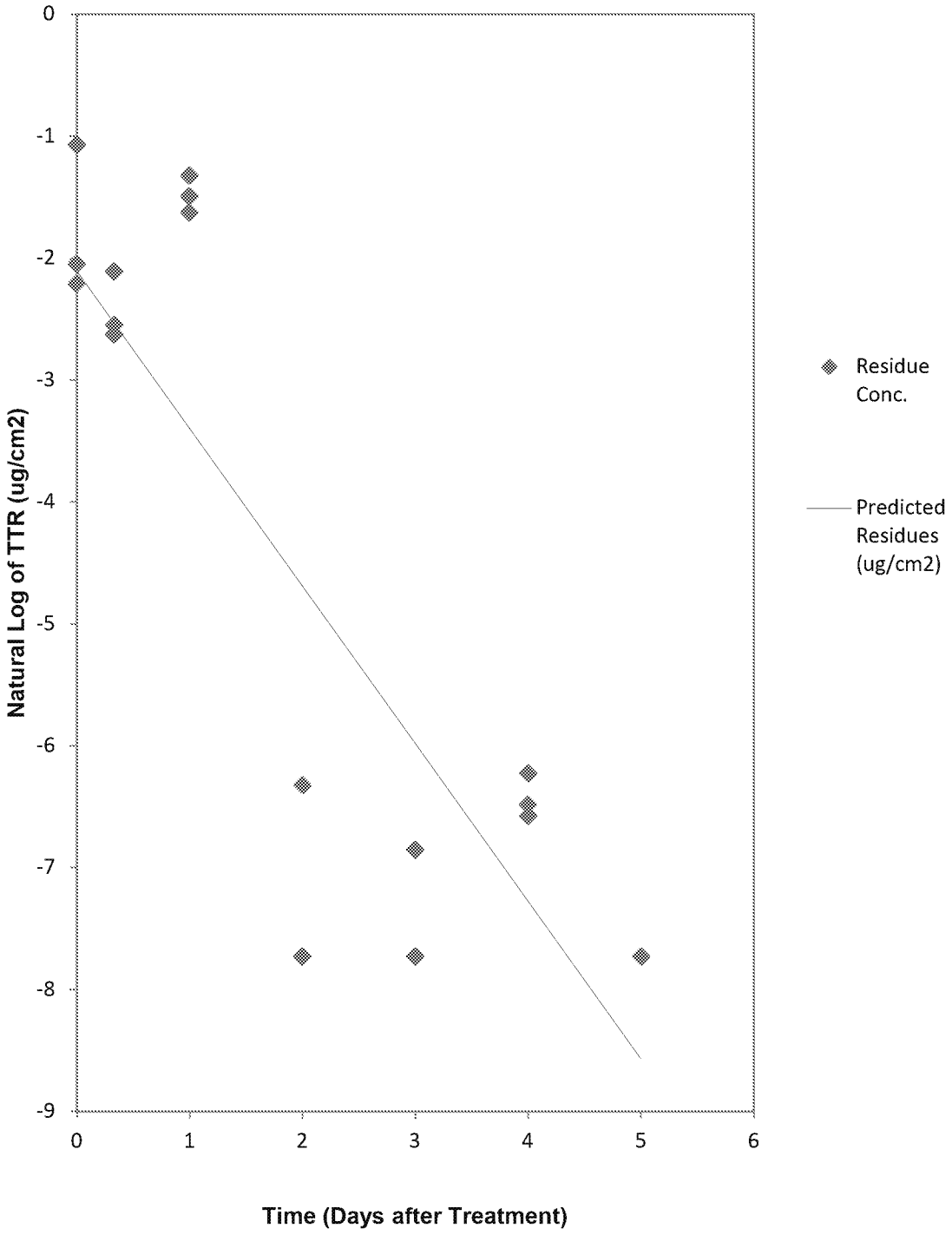
Time (Days)	Residue (ug/cm2)
21	1.97E-13
22	5.407E-14
23	1.484E-14
24	4.073E-15
25	1.118E-15
26	3.068E-16
27	8.419E-17
28	2.311E-17
29	6.341E-18
30	1.74E-18
31	4.776E-19
32	1.311E-19
33	3.597E-20
34	9.873E-21
35	2.71E-21

20 7.18E-13

Regression Analysis: Means and CVs for North Carolina TTR 2,4-D TRT 2

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	**0.1101**	0.194	0.129	66.5
	0.3426			
	0.1294			
0.3333	**0.1212**	0.0905	0.0267	29.5
	0.0780			
	0.0724			
1	**0.2664**	0.229	0.0351	15.3
	0.1967			
	0.2246			
2	**0.0018**	0.000891	0.000783	87.9
	0.0004			
	0.0004			
3	**0.0004**	0.000644	0.000354	55
	0.0011			
	0.0004			
4	**0.0015**	0.00163	0.000304	18.6
	0.0020			
	0.0014			
5	**0.0004**	0.00044	0	0
	0.0004			
	0.0004			

Regression Analysis: Log of Transferable Turf Residue vs. Time for North Carolina TTR 2,4-D TRT 2



Regression Analysis: Summary Output for North Carolina TTR 2,4-D TRT 3

Regression Statistics	
Multiple R	0.95015
R Square	0.902786
Adjusted R^2	0.895308
Standard Error	0.920455
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	102.283	102.283	120.72522	5.97044E-08
Residual	13	11.0141	0.847238		
Total	14	113.2971			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-1.27061	0.3618	-3.5119	0.0038257	-2.052228424	-0.488985067
Slope	-2.36631	0.215364	-10.9875	5.97E-08	-2.831578343	-1.901047038

Half Life = 0.292923 Days

Predicted TTR Levels

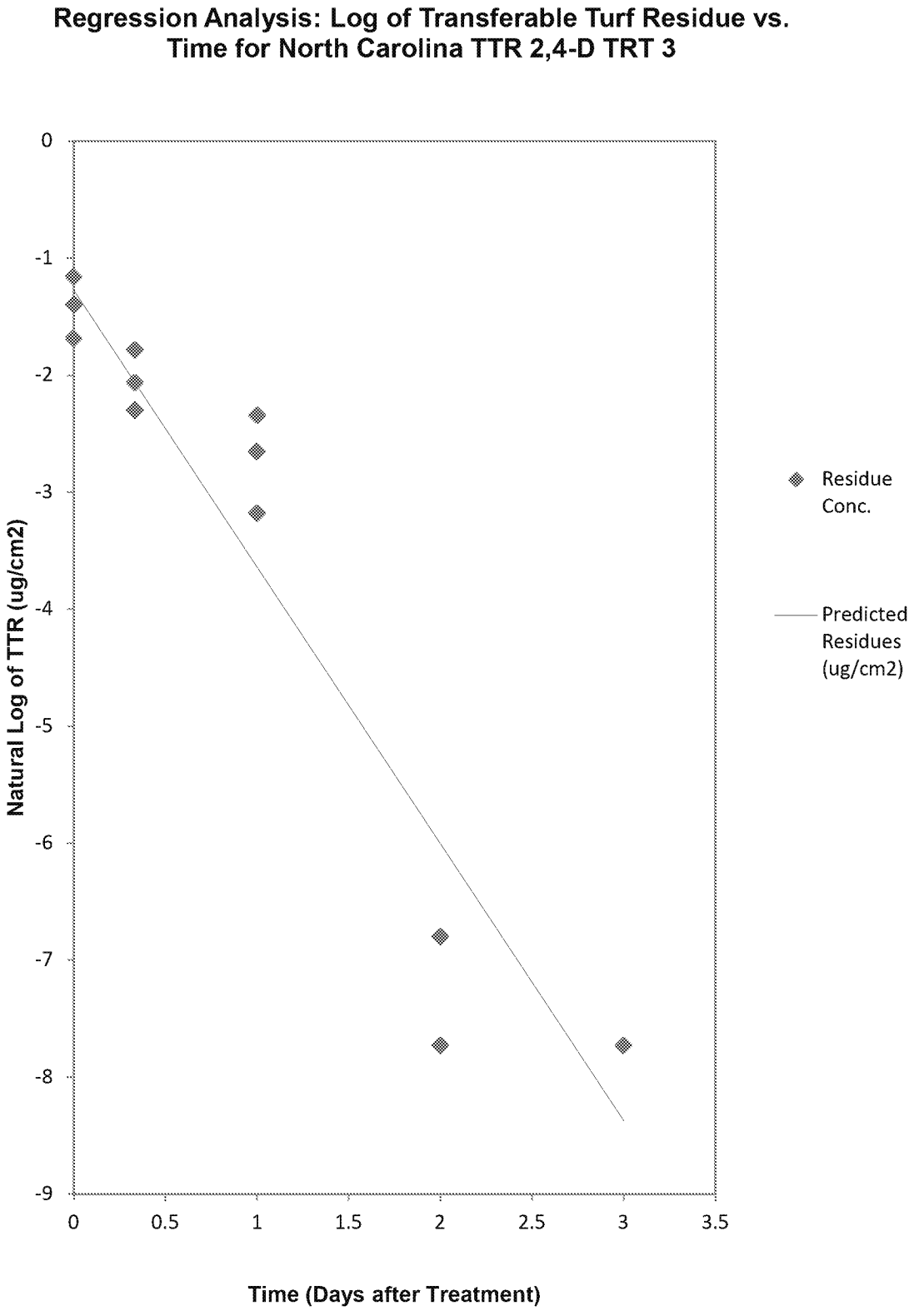
Time (Days)	Residue (ug/cm2)
0	0.280661
1	0.026333
2	0.002471
3	0.000232
4	2.18E-05
5	2.04E-06
6	1.91E-07
7	1.8E-08
8	1.69E-09
9	1.58E-10
10	1.48E-11
11	1.39E-12
12	1.31E-13
13	1.23E-14
14	1.15E-15
15	1.08E-16
16	1.01E-17
17	9.5E-19
18	8.91E-20
19	8.36E-21

Time (Days)	Residue (ug/cm2)
21	7.362E-23
22	6.907E-24
23	6.481E-25
24	6.081E-26
25	5.705E-27
26	5.353E-28
27	5.022E-29
28	4.712E-30
29	4.421E-31
30	4.148E-32
31	3.892E-33
32	3.652E-34
33	3.427E-35
34	3.215E-36
35	3.017E-37

20 7.85E-22

Regression Analysis: Means and CVs for North Carolina TTR 2,4-D TRT 3

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	**0.3134**	0.249	0.0641	25.7
	0.2474			
	0.1852			
0.3333	**0.1675**	0.132	0.0338	25.6
	0.1269			
	0.1004			
1	**0.0705**	0.0694	0.0274	39.4
	0.0415			
	0.0962			
2	**0.0011**	0.000664	0.000389	58.6
	0.0004			
	0.0004			
3	**0.0004**	0.00044	0	0
	0.0004			
	0.0004			


Regression Analysis: Log of Transferable Turf Residue vs. Time for North Carolina TTR 2,4-D TRT 3
Natural Log of TTR (ug/cm2)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
0
0.5
1
1.5
2
2.5
3
3.5
Time (Days after Treatment)
Residue Conc.
Predicted Residues (ug/cm2)

Regression Analysis: Summary Output for North Carolina TTR 2,4-D TRT 4

Regression Statistics	
Multiple R	0.981198
R Square	0.96275
Adjusted R^2	0.959885
Standard Error	0.508585
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	86.90746	86.90746	335.99255	1.13784E-10
Residual	13	3.362566	0.258659		
Total	14	90.27003			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-1.4172	0.199908	-7.08926	8.18E-06	-1.849073414	-0.985324479
Slope	-2.18122	0.118996	-18.3301	1.138E-10	-2.438293259	-1.924140795

Half Life = 0.31778 Days

Predicted TTR Levels

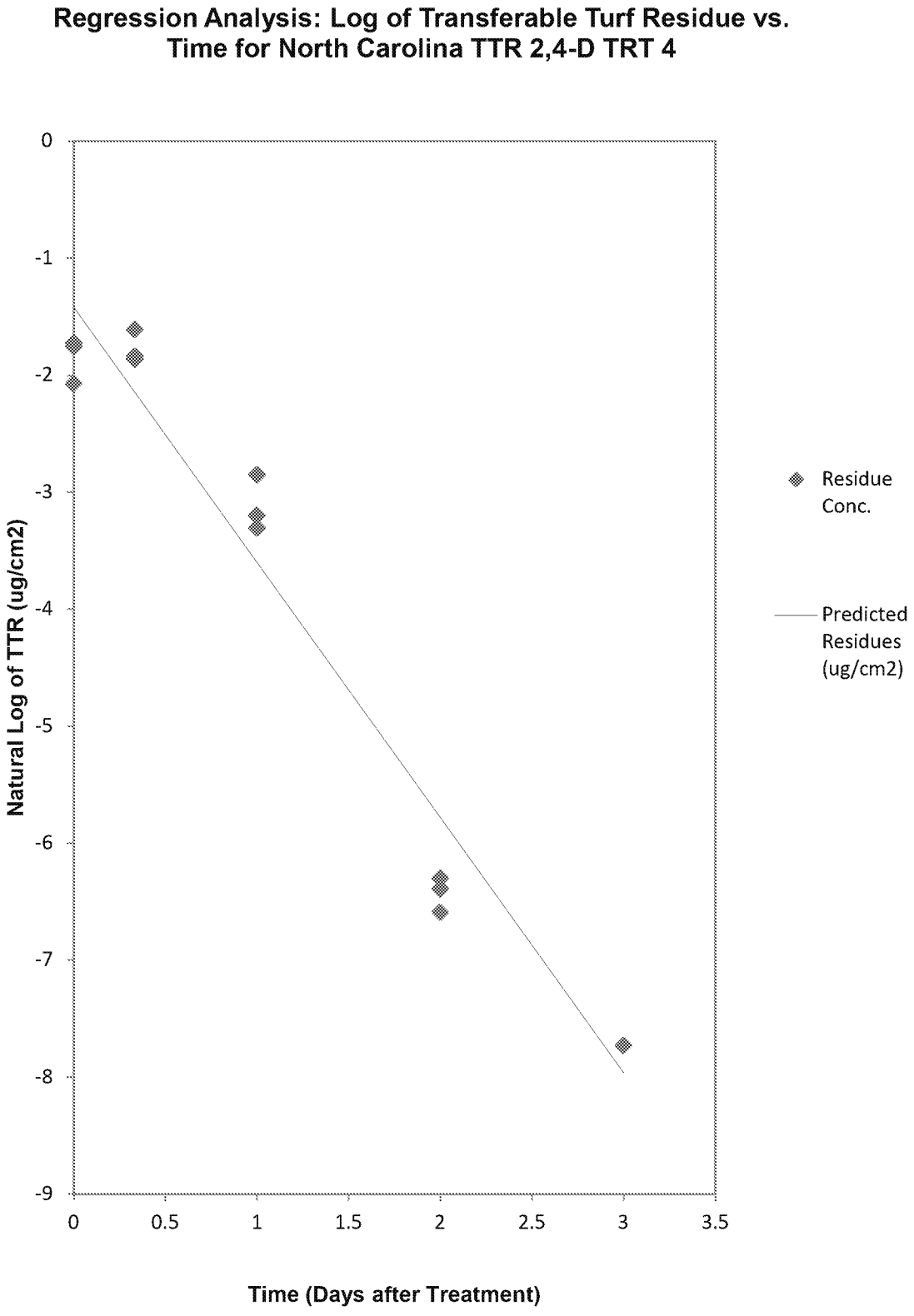
Time (Days)	Residue (ug/cm2)
0	0.242392
1	0.027367
2	0.00309
3	0.000349
4	3.94E-05
5	4.45E-06
6	5.02E-07
7	5.67E-08
8	6.4E-09
9	7.23E-10
10	8.16E-11
11	9.21E-12
12	1.04E-12
13	1.17E-13
14	1.33E-14
15	1.5E-15
16	1.69E-16
17	1.91E-17
18	2.15E-18
19	2.43E-19

Time (Days)	Residue (ug/cm2)
21	3.1E-21
22	3.5E-22
23	3.952E-23
24	4.462E-24
25	5.038E-25
26	5.688E-26
27	6.422E-27
28	7.251E-28
29	8.186E-29
30	9.243E-30
31	1.044E-30
32	1.178E-31
33	1.33E-32
34	1.502E-33
35	1.696E-34

20 2.75E-20

Regression Analysis: Means and CVs for North Carolina TTR 2,4-D TRT 4

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	**0.1776**	0.159	0.0284	17.9
	0.1261			
	0.1726			
0.3333	**0.1548**	0.171	0.0253	14.8
	0.2005			
	0.1586			
1	**0.0367**	0.045	0.0112	24.8
	0.0407			
	0.0577			
2	**0.0018**	0.00163	0.000237	14.6
	0.0014			
	0.0017			
3	**0.0004**	0.00044	0	0
	0.0004			
	0.0004			


Regression Analysis: Log of Transferable Turf Residue vs. Time for North Carolina TTR 2,4-D TRT 4
Natural Log of TTR (ug/cm2)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
0
0.5
1
1.5
2
2.5
3
3.5
Time (Days after Treatment)
Residue Conc.
Predicted Residues (ug/cm2)

Regression Analysis: Summary Output for North Carolina TTR MCPP TRT 2

Regression Statistics	
Multiple R	0.892365
R Square	0.796315
Adjusted R^2	0.780647
Standard Error	1.131387
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	65.05685	65.05685	50.824173	7.71187E-06
Residual	13	16.64049	1.280037		
Total	14	81.69733			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-2.40352	0.44471	-5.40469	0.0001202	-3.364262419	-1.442785578
Slope	-1.8872	0.264717	-7.12911	7.712E-06	-2.459081429	-1.315309192

Half Life = 0.36729 Days

Predicted TTR Levels

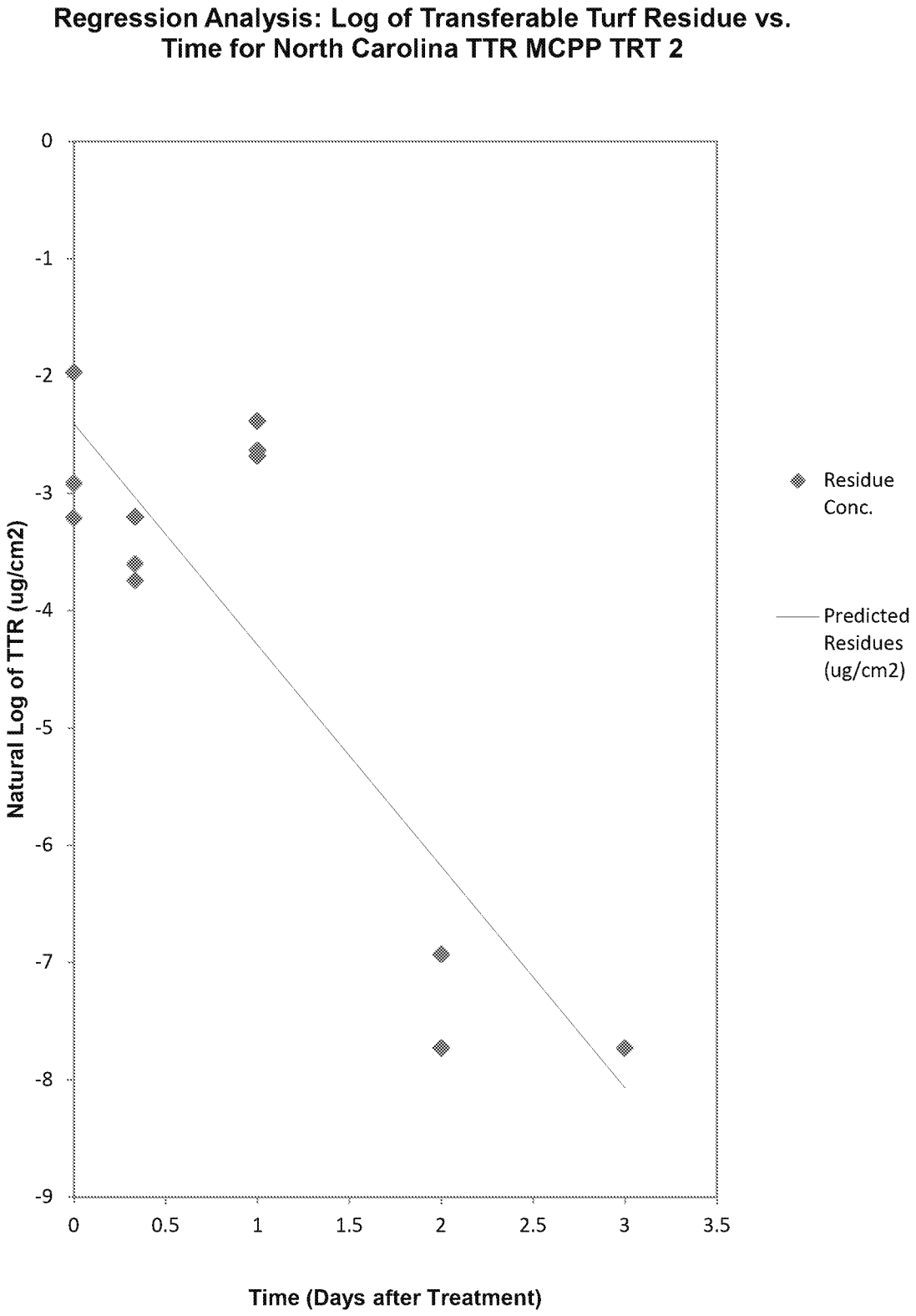
Time (Days)	Residue (ug/cm2)
0	0.090399
1	0.013695
2	0.002075
3	0.000314
4	4.76E-05
5	7.21E-06
6	1.09E-06
7	1.66E-07
8	2.51E-08
9	3.8E-09
10	5.76E-10
11	8.72E-11
12	1.32E-11
13	2E-12
14	3.03E-13
15	4.59E-14
16	6.96E-15
17	1.05E-15
18	1.6E-16
19	2.42E-17

Time (Days)	Residue (ug/cm2)
21	5.554E-19
22	8.414E-20
23	1.275E-20
24	1.931E-21
25	2.925E-22
26	4.432E-23
27	6.714E-24
28	1.017E-24
29	1.541E-25
30	2.335E-26
31	3.537E-27
32	5.358E-28
33	8.117E-29
34	1.23E-29
35	1.863E-30

20 3.67E-18

Regression Analysis: Means and CVs for North Carolina TTR MCPP TRT 2

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	**0.0402**	0.0782	0.0541	69.2
	0.1401			
	0.0542			
0.3333	**0.0408**	0.0306	0.00898	29.4
	0.0273			
	0.0238			
1	**0.0921**	0.0774	0.0128	16.5
	0.0685			
	0.0718			
2	**0.0010**	0.00062	0.000312	50.3
	0.0004			
	0.0004			
3	**0.0004**	0.00044	0	0
	0.0004			
	0.0004			


Regression Analysis: Log of Transferable Turf Residue vs. Time for North Carolina TTR MCPP TRT 2
Natural Log of TTR (ug/cm2)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
0
0.5
1
1.5
2
2.5
3
3.5
Time (Days after Treatment)
Residue Conc.
Predicted Residues (ug/cm2)

Regression Analysis: Summary Output for North Carolina TTR MCPP TRT 3

Regression Statistics	
Multiple R	0.96579
R Square	0.93275
Adjusted R^2	0.926025
Standard Error	0.58446
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	47.37857	47.37857	138.69849	3.48424E-07
Residual	10	3.41594	0.341594		
Total	11	50.79451			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-2.16348	0.249709	-8.66402	5.818E-06	-2.719868406	-1.60709688
Slope	-2.60161	0.220905	-11.777	3.484E-07	-3.093816215	-2.109400952

Half Life = 0.26643 Days

Predicted TTR Levels

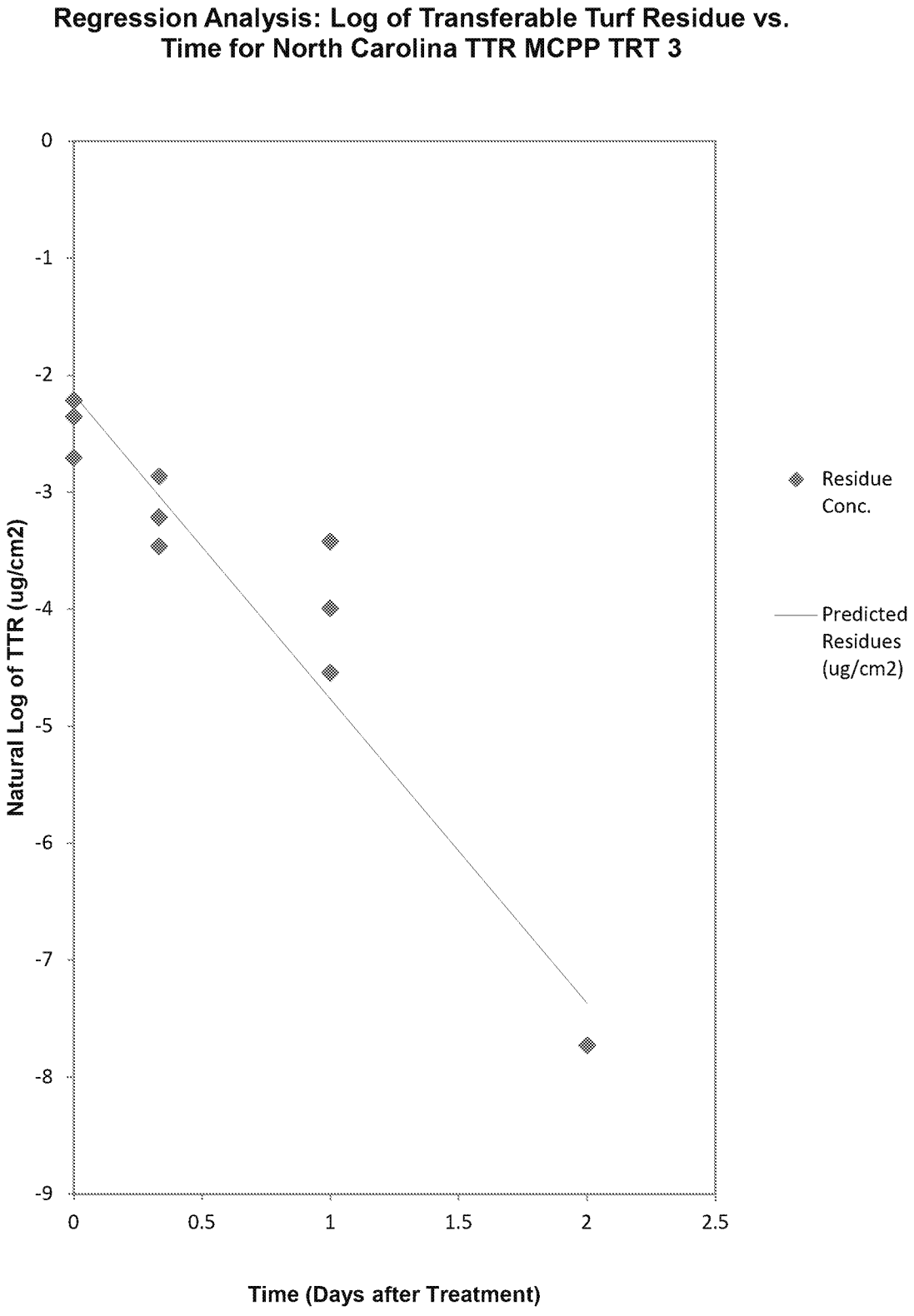
Time (Days)	Residue (ug/cm2)
0	0.114924
1	0.008522
2	0.000632
3	4.69E-05
4	3.47E-06
5	2.58E-07
6	1.91E-08
7	1.42E-09
8	1.05E-10
9	7.79E-12
10	5.78E-13
11	4.28E-14
12	3.18E-15
13	2.36E-16
14	1.75E-17
15	1.3E-18
16	9.61E-20
17	7.12E-21
18	5.28E-22
19	3.92E-23

Time (Days)	Residue (ug/cm2)
21	2.154E-25
22	1.597E-26
23	1.184E-27
24	8.784E-29
25	6.513E-30
26	4.83E-31
27	3.582E-32
28	2.656E-33
29	1.969E-34
30	1.46E-35
31	1.083E-36
32	8.031E-38
33	5.955E-39
34	4.416E-40
35	3.275E-41

20 2.9E-24

Regression Analysis: Means and CVs for North Carolina TTR MCPP TRT 3

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	**0.1092**	0.0902	0.0214	23.7
	0.0946			
	0.0670			
0.3333	**0.0568**	0.0428	0.013	30.3
	0.0401			
	0.0313			
1	**0.0185**	0.0205	0.0111	54.2
	0.0106			
	0.0325			
2	**0.0004**	0.00044	0	0
	0.0004			
	0.0004			


Regression Analysis: Log of Transferable Turf Residue vs. Time for North Carolina TTR MCPP TRT 3
Natural Log of TTR (ug/cm2)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
0
0.5
1
1.5
2
2.5
Time (Days after Treatment)
Residue Conc.
Predicted Residues (ug/cm2)

Regression Analysis: Summary Output for North Carolina TTR MCPP TRT 4

Regression Statistics	
Multiple R	0.98281
R Square	0.965915
Adjusted R^2	0.962506
Standard Error	0.390836
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	43.2872	43.2872	283.38088	1.14869E-08
Residual	10	1.527527	0.152753		
Total	11	44.81473			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-2.55618	0.166983	-15.308	2.875E-08	-2.928246036	-2.184121924
Slope	-2.48674	0.147722	-16.8339	1.149E-08	-2.815887399	-2.157596711

Half Life = 0.278737 Days

Predicted TTR Levels

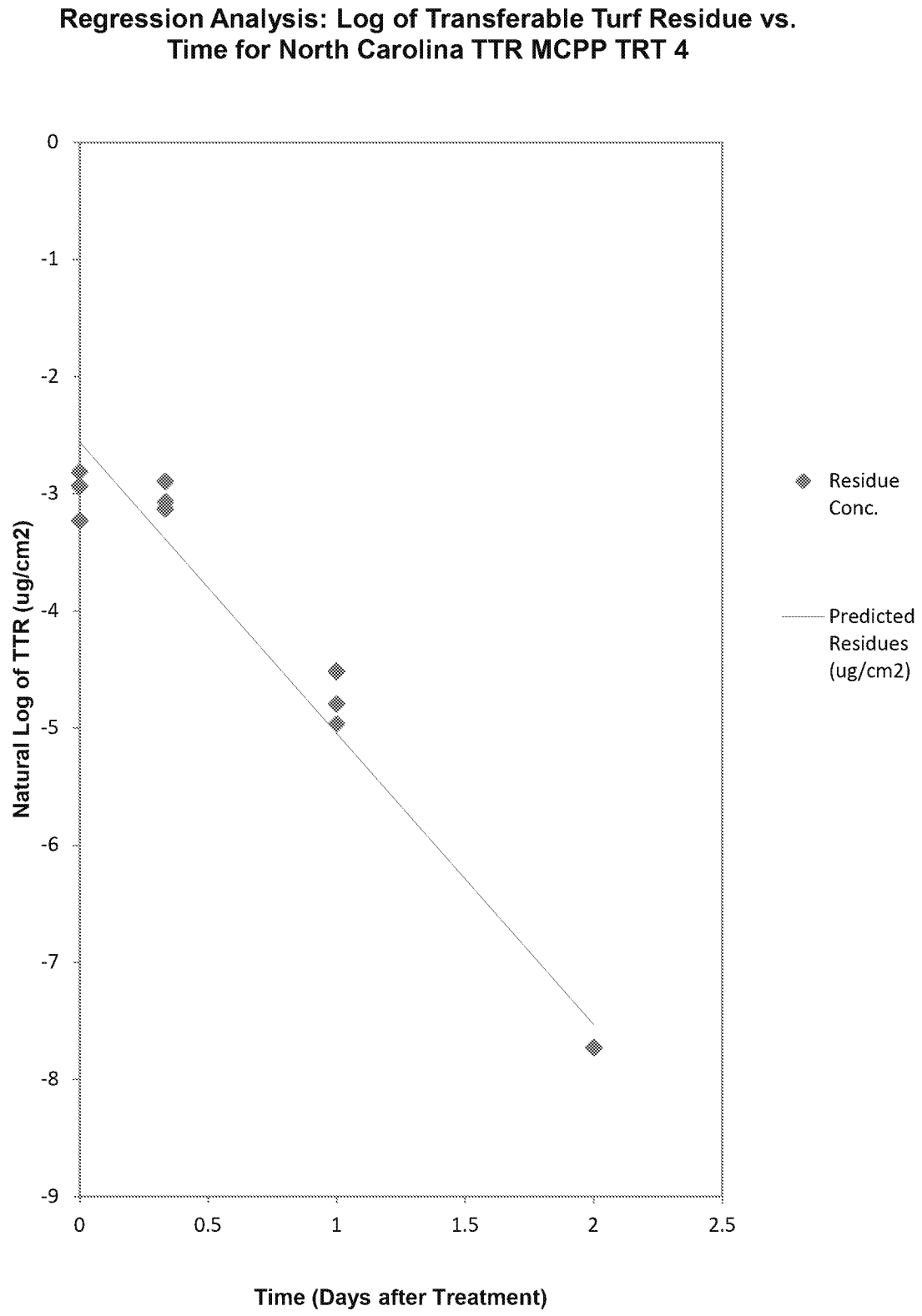
Time (Days)	Residue (ug/cm2)
0	0.0776
1	0.006455
2	0.000537
3	4.47E-05
4	3.71E-06
5	3.09E-07
6	2.57E-08
7	2.14E-09
8	1.78E-10
9	1.48E-11
10	1.23E-12
11	1.02E-13
12	8.51E-15
13	7.08E-16
14	5.89E-17
15	4.9E-18
16	4.08E-19
17	3.39E-20
18	2.82E-21
19	2.35E-22

Time (Days)	Residue (ug/cm2)
21	1.623E-24
22	1.35E-25
23	1.123E-26
24	9.341E-28
25	7.77E-29
26	6.463E-30
27	5.376E-31
28	4.472E-32
29	3.72E-33
30	3.094E-34
31	2.574E-35
32	2.141E-36
33	1.781E-37
34	1.481E-38
35	1.232E-39

20 1.95E-23

Regression Analysis: Means and CVs for North Carolina TTR MCPP TRT 4

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	**0.0601**	0.0509	0.0104	20.4
	0.0397			
	0.0530			
0.3333	**0.0464**	0.0485	0.00592	12.2
	0.0551			
	0.0438			
1	**0.0070**	0.00871	0.00202	23.2
	0.0082			
	0.0109			
2	**0.0004**	0.00044	0	0
	0.0004			
	0.0004			


Regression Analysis: Log of Transferable Turf Residue vs. Time for North Carolina TTR MCPP TRT 4
Natural Log of TTR (ug/cm2)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
0
0.5
1
1.5
2
2.5
Time (Days after Treatment)
Residue Conc.
Predicted Residues (ug/cm2)

Regression Analysis: Summary Output for North Carolina TTR Dicamba TRT 2

Regression Statistics	
Multiple R	0.7892
R Square	0.622837
Adjusted R^2	0.585121
Standard Error	1.176404
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	22.85378	22.85378	16.513727	0.002272991
Residual	10	13.83926	1.383926		
Total	11	36.69304			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-3.31901	0.502615	-6.60349	6.052E-05	-4.438907751	-2.199117467
Slope	-1.80688	0.444639	-4.06371	0.002273	-2.797600034	-0.816165668

Half Life = 0.383615 Days

Predicted TTR Levels

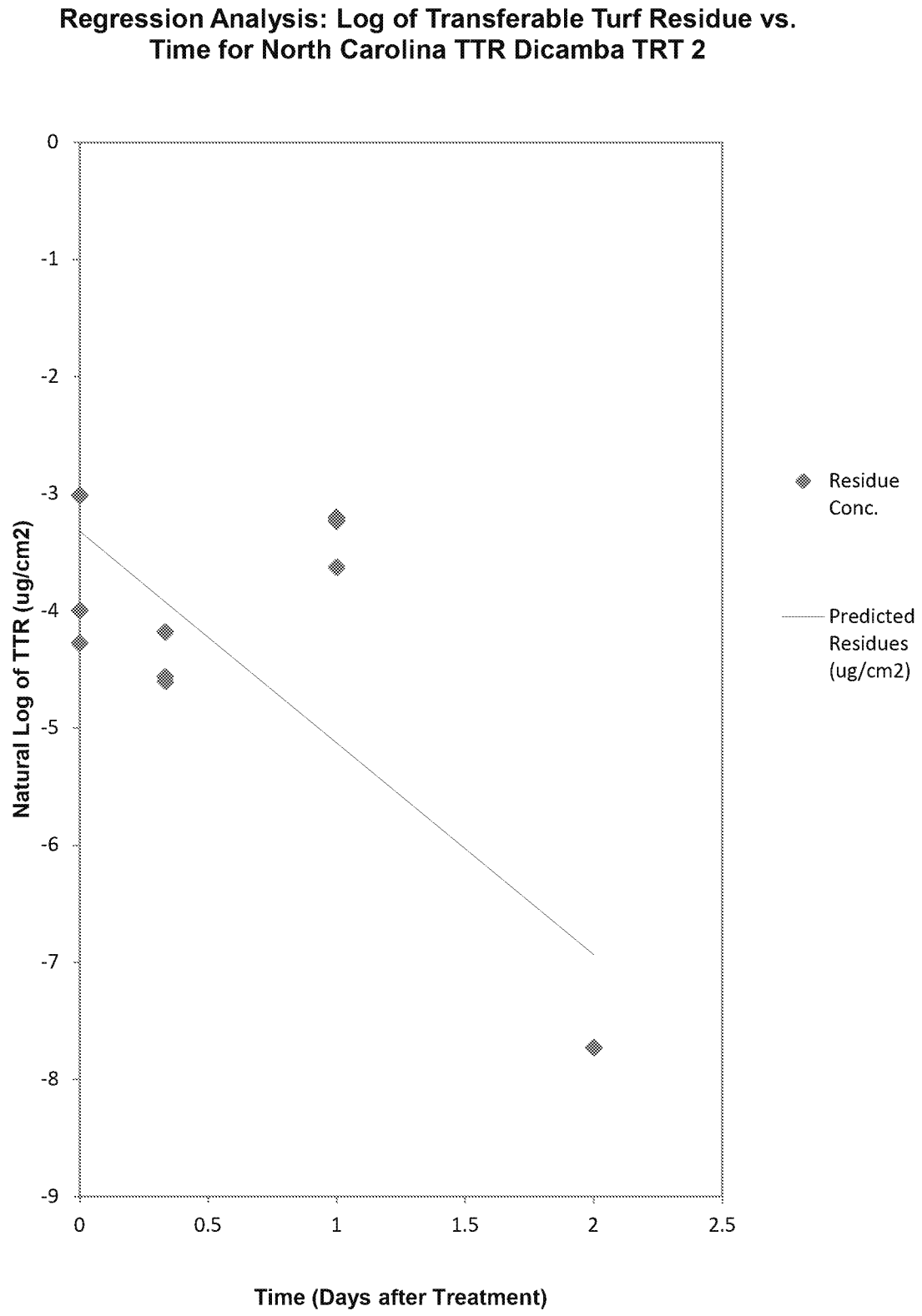
Time (Days)	Residue (ug/cm2)
0	0.036189
1	0.005941
2	0.000975
3	0.00016
4	2.63E-05
5	4.31E-06
6	7.08E-07
7	1.16E-07
8	1.91E-08
9	3.13E-09
10	5.14E-10
11	8.45E-11
12	1.39E-11
13	2.28E-12
14	3.74E-13
15	6.13E-14
16	1.01E-14
17	1.65E-15
18	2.71E-16
19	4.46E-17

Time (Days)	Residue (ug/cm2)
21	1.201E-18
22	1.971E-19
23	3.236E-20
24	5.313E-21
25	8.721E-22
26	1.432E-22
27	2.35E-23
28	3.859E-24
29	6.335E-25
30	1.04E-25
31	1.707E-26
32	2.803E-27
33	4.601E-28
34	7.553E-29
35	1.24E-29

20 7.31E-18

Regression Analysis: Means and CVs for North Carolina TTR Dicamba TRT 2

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	**0.0139**	0.0271	0.0191	70.5
	0.0490			
	0.0184			
0.3333	**0.0152**	0.0119	0.00291	24.4
	0.0100			
	0.0104			
1	**0.0407**	0.0355	0.00777	21.9
	0.0266			
	0.0393			
2	**0.0004**	0.00044	0	0
	0.0004			
	0.0004			


Regression Analysis: Log of Transferable Turf Residue vs. Time for North Carolina TTR Dicamba TRT 2
Natural Log of TTR (ug/cm2)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
0
0.5
1
1.5
2
2.5
Time (Days after Treatment)
Residue Conc.
Predicted Residues (ug/cm2)

Regression Analysis: Summary Output for North Carolina TTR Dicamba TRT 3

Regression Statistics	
Multiple R	0.966824
R Square	0.934748
Adjusted R^2	0.928223
Standard Error	0.474517
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	32.25574	32.25574	143.25293	2.99373E-07
Residual	10	2.251663	0.225166		
Total	11	34.5074			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-3.19061	0.202736	-15.7378	2.202E-08	-3.642336475	-2.738889617
Slope	-2.14662	0.179351	-11.9688	2.994E-07	-2.546234405	-1.746998573

Half Life = 0.322902 Days

Predicted TTR Levels

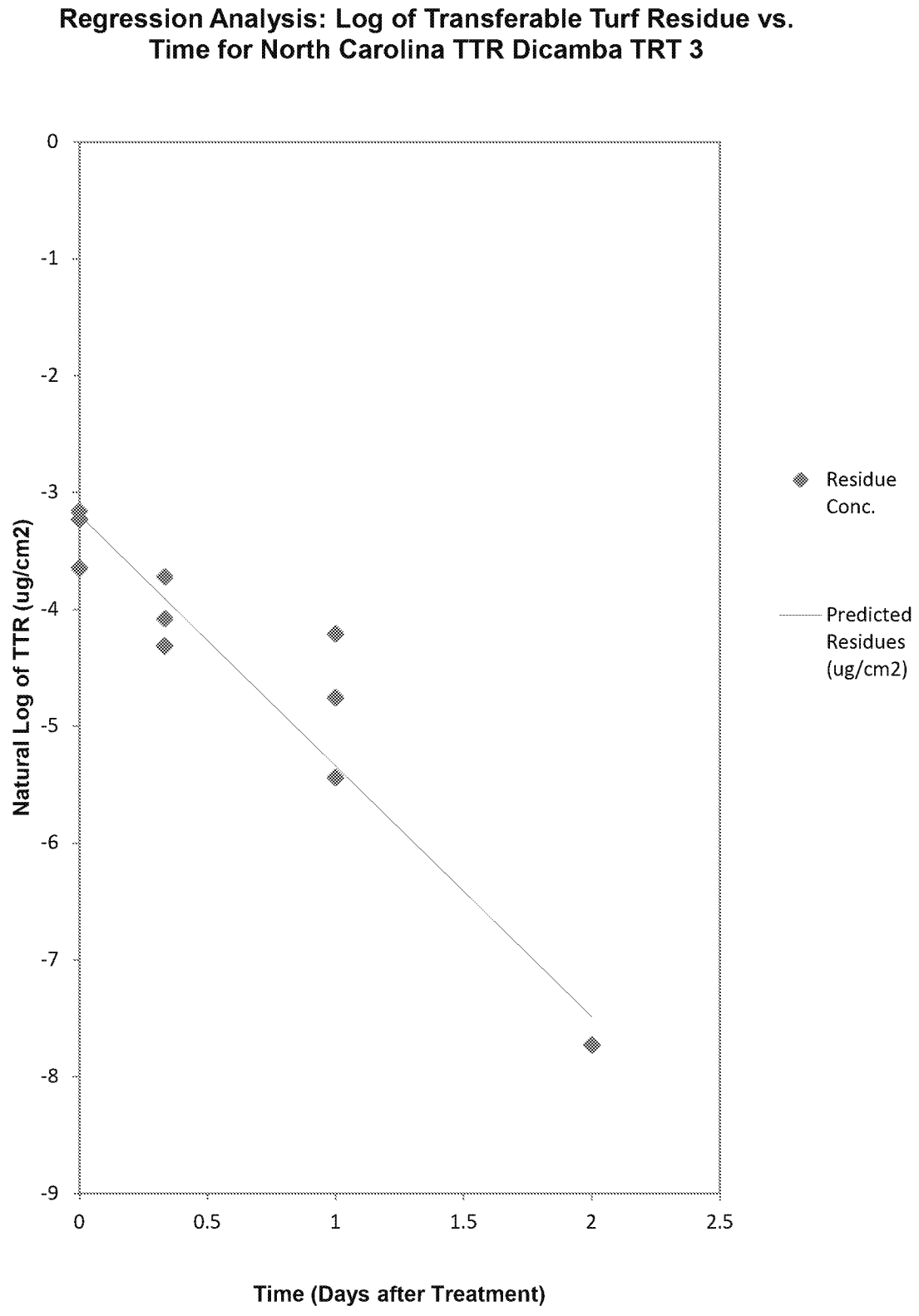
Time (Days)	Residue (ug/cm2)
0	0.041147
1	0.004809
2	0.000562
3	6.57E-05
4	7.68E-06
5	8.97E-07
6	1.05E-07
7	1.23E-08
8	1.43E-09
9	1.67E-10
10	1.96E-11
11	2.29E-12
12	2.67E-13
13	3.13E-14
14	3.65E-15
15	4.27E-16
16	4.99E-17
17	5.83E-18
18	6.82E-19
19	7.97E-20

Time (Days)	Residue (ug/cm2)
21	1.088E-21
22	1.272E-22
23	1.487E-23
24	1.738E-24
25	2.031E-25
26	2.374E-26
27	2.775E-27
28	3.243E-28
29	3.79E-29
30	4.43E-30
31	5.178E-31
32	6.052E-32
33	7.073E-33
34	8.267E-34
35	9.663E-35

20 9.31E-21

Regression Analysis: Means and CVs for North Carolina TTR Dicamba TRT 3

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	**0.0424**	0.036	0.00878	24.4
	0.0395			
	0.0260			
0.3333	**0.0242**	0.0181	0.00553	30.5
	0.0169			
	0.0134			
1	**0.0086**	0.00927	0.00529	57.1
	0.0043			
	0.0149			
2	**0.0004**	0.00044	0	0
	0.0004			
	0.0004			


Regression Analysis: Log of Transferable Turf Residue vs. Time for North Carolina TTR Dicamba TRT 3
Natural Log of TTR (ug/cm2)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
0
0.5
1
1.5
2
2.5
Time (Days after Treatment)
Residue Conc.
Predicted Residues (ug/cm2)

Regression Analysis: Summary Output for North Carolina TTR Dicamba TRT 4

Regression Statistics	
Multiple R	0.971085
R Square	0.943007
Adjusted R^2	0.937307
Standard Error	0.429416
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	30.51045	30.51045	165.45955	1.51633E-07
Residual	10	1.843982	0.184398		
Total	11	32.35443			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-3.44662	0.183467	-18.7861	3.955E-09	-3.855413601	-3.037835438
Slope	-2.08773	0.162304	-12.8631	1.516E-07	-2.449370552	-1.72609861

Half Life = 0.332009 Days

Predicted TTR Levels

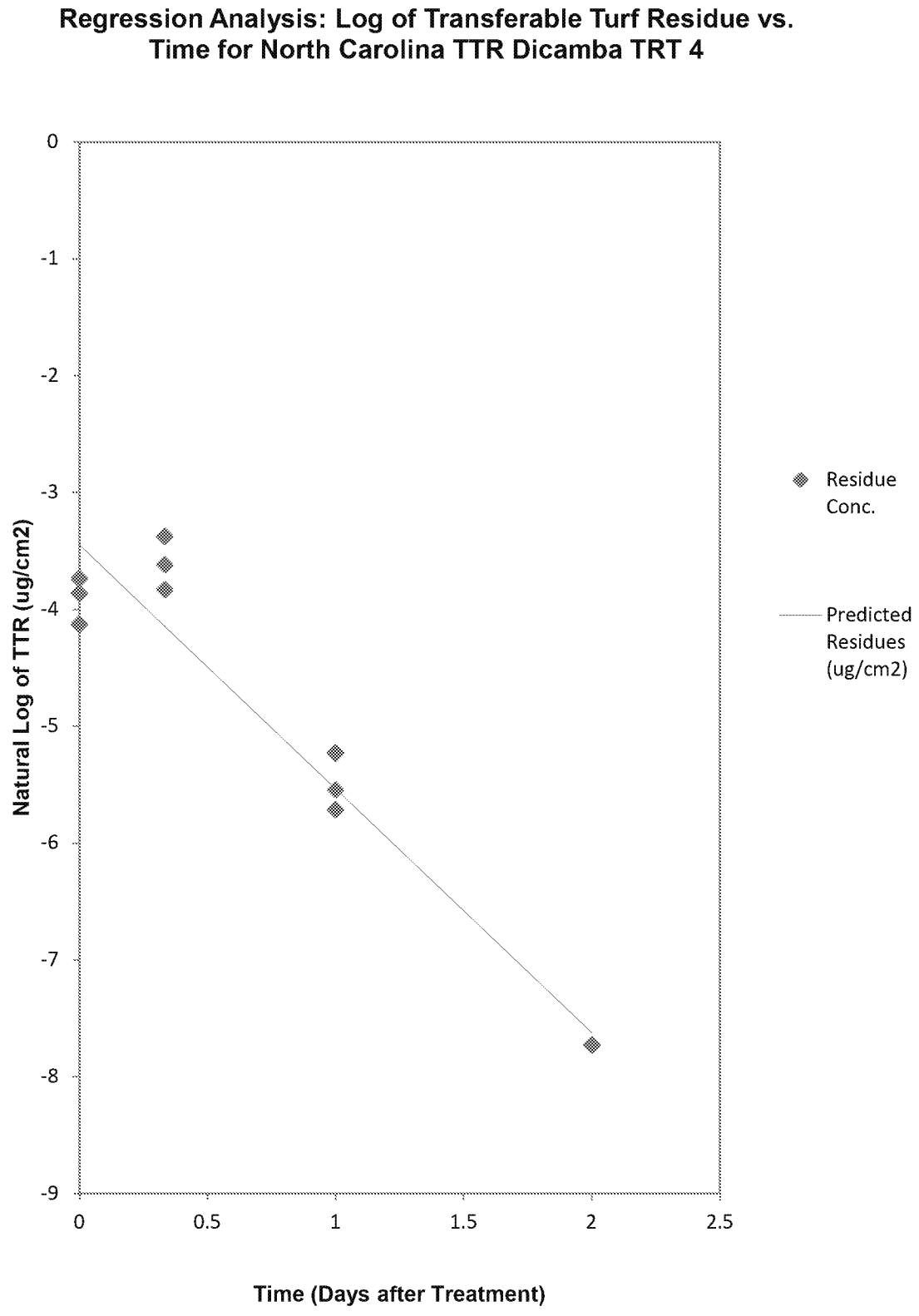
Time (Days)	Residue (ug/cm2)
0	0.031853
1	0.003949
2	0.00049
3	6.07E-05
4	7.52E-06
5	9.33E-07
6	1.16E-07
7	1.43E-08
8	1.78E-09
9	2.2E-10
10	2.73E-11
11	3.38E-12
12	4.2E-13
13	5.2E-14
14	6.45E-15
15	7.99E-16
16	9.91E-17
17	1.23E-17
18	1.52E-18
19	1.89E-19

Time (Days)	Residue (ug/cm2)
21	2.902E-21
22	3.597E-22
23	4.459E-23
24	5.528E-24
25	6.853E-25
26	8.495E-26
27	1.053E-26
28	1.306E-27
29	1.618E-28
30	2.006E-29
31	2.487E-30
32	3.083E-31
33	3.822E-32
34	4.738E-33
35	5.874E-34

20 2.34E-20

Regression Analysis: Means and CVs for North Carolina TTR Dicamba TRT 4

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	**0.0238**	0.0203	0.00388	19.1
	0.0161			
	0.0209			
0.3333	**0.0217**	0.0276	0.0063	22.8
	0.0342			
	0.0268			
1	**0.0033**	0.00418	0.00105	25.1
	0.0039			
	0.0053			
2	**0.0004**	0.00044	0	0
	0.0004			
	0.0004			


Regression Analysis: Log of Transferable Turf Residue vs. Time for North Carolina TTR Dicamba TRT 4
Natural Log of TTR (ug/cm2)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
0
0.5
1
1.5
2
2.5
Time (Days after Treatment)
Residue Conc.
Predicted Residues (ug/cm2)